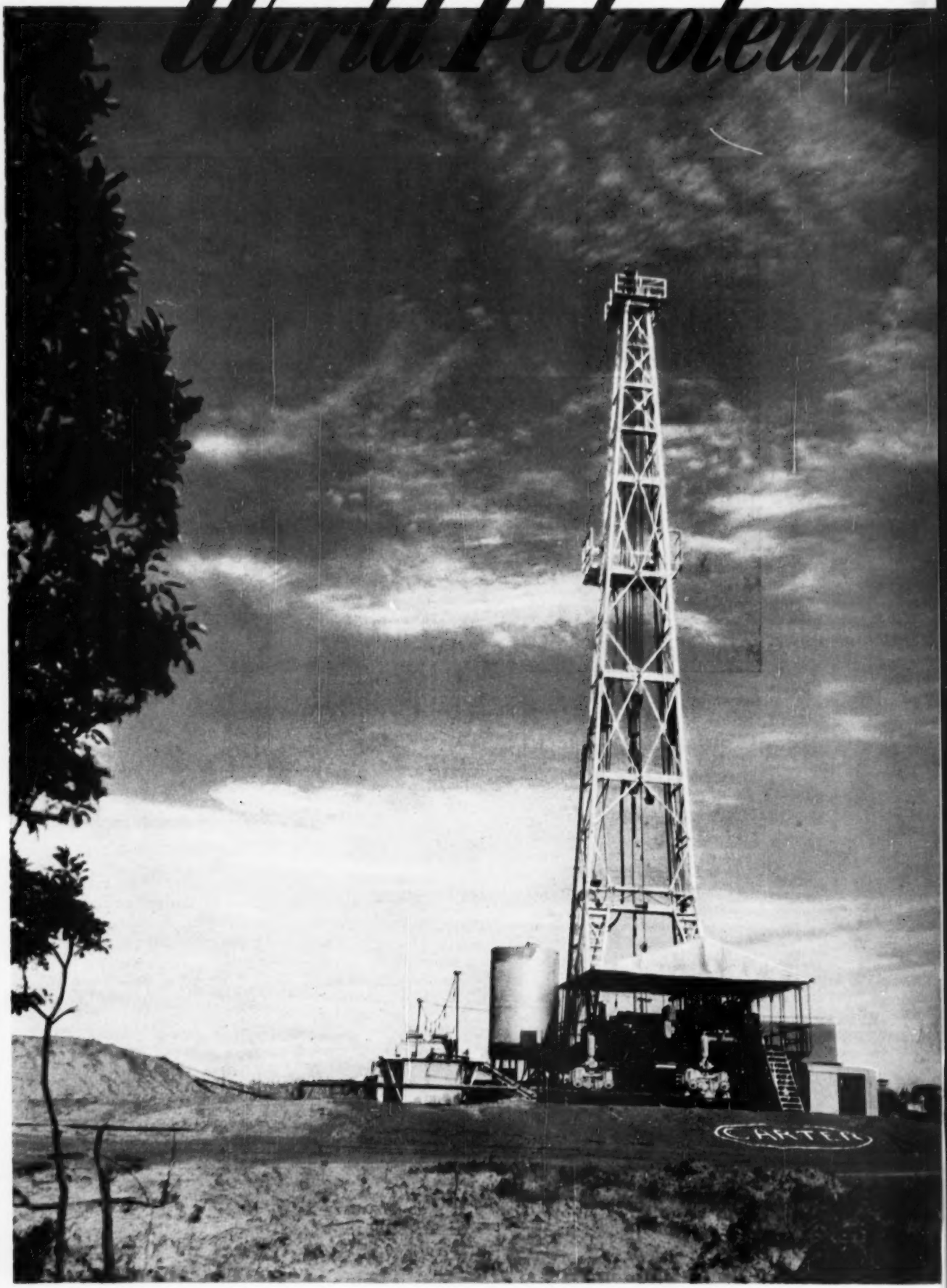
World Petroleum



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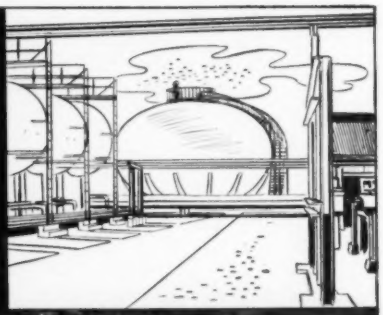
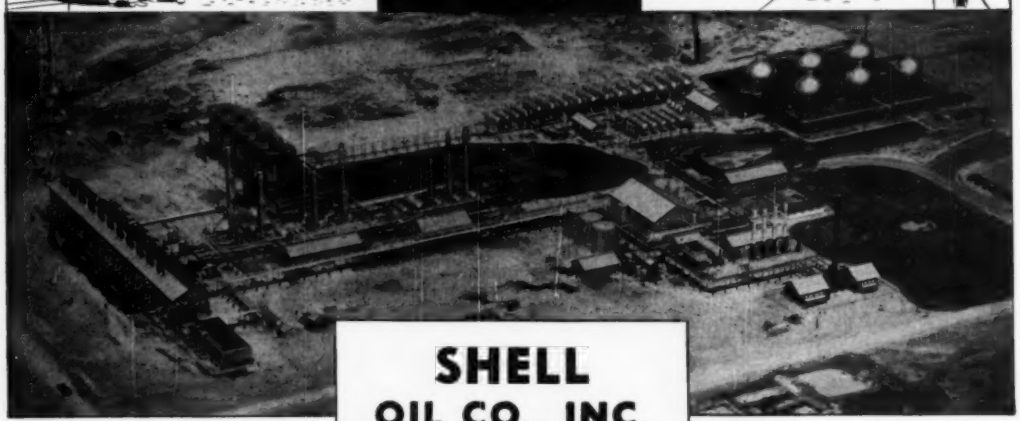
JUNE, 1949

STORY OF A JOB





SHELL OIL CO., INC. TXL GASOLINE PLANT NOTREES, TEXAS

The best laid plans of men are frequently subjected to change by various influencing circumstances. Such was the case at Shell Oil Company's TXL Gasoline Plant near Odessa, Texas. Brown & Root, Inc., was awarded the contract to build a 30,000 mcf gasoline plant for Shell. During construction, new field development made it necessary to increase the throughput to 45,000 mcf. Shortly after completion, still further demands necessitated tripling the original capacity to handle 90,000 mcf!

We believe flexibility to meet changing conditions is the prime asset of any contractor. Brown & Root, Inc., will do ALL of your engineering and construction or will work closely with your own technical personnel to fit your needs.

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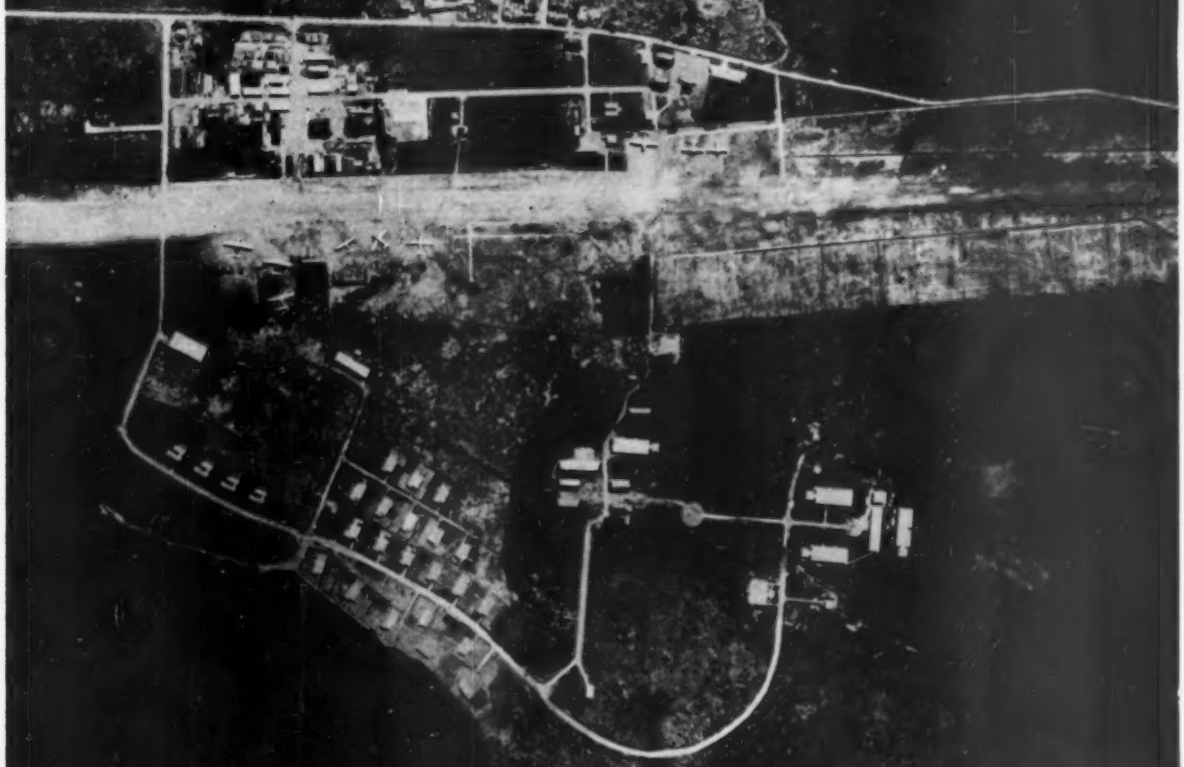

To no single industry does the use of aircraft present such revolutionary possibilities as it does to oil drilling. Remotely sited or inaccessible workings can be reached in minutes or hours instead of days or weeks. Air transport for key technicians and urgently needed spares reduces production hold-ups to a minimum. Speedy despatch of medical supplies, availability of air ambulance services, establishes close touch with civilization. Daily supplies of hitherto unobtainable fresh foods, by maintaining fitness, increase output. Surveys and inspections are completed in a fraction of the time. In short, air transport by very considerably reducing the all important time factor when applied to "key" problems, increases output and, where weather is a limiting factor, may increase the number of working days. *In some cases, even one light aeroplane would serve the purpose!* But air transport, when reliable and economical, is a science in itself, whether for a fleet, or for a single aircraft. In whatever part of the world, Airwork Limited can provide the organisation for efficient and economic operation of your own air transport. Airwork Limited, the founders of Heston Airport, are the largest British Air Transport Contractors specialising in these problems since 1929.

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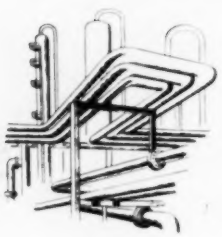

Graver men and Graver equipment are available at strategic locations to bring the complete service to your construction project . . . whether it includes piping, masonry, equipment setting, electrical installations or erection of heavy vessels.

The facilities and experience of the Graver Construction Co. are available to you *now*. Write today for full information and quotations on your construction job.

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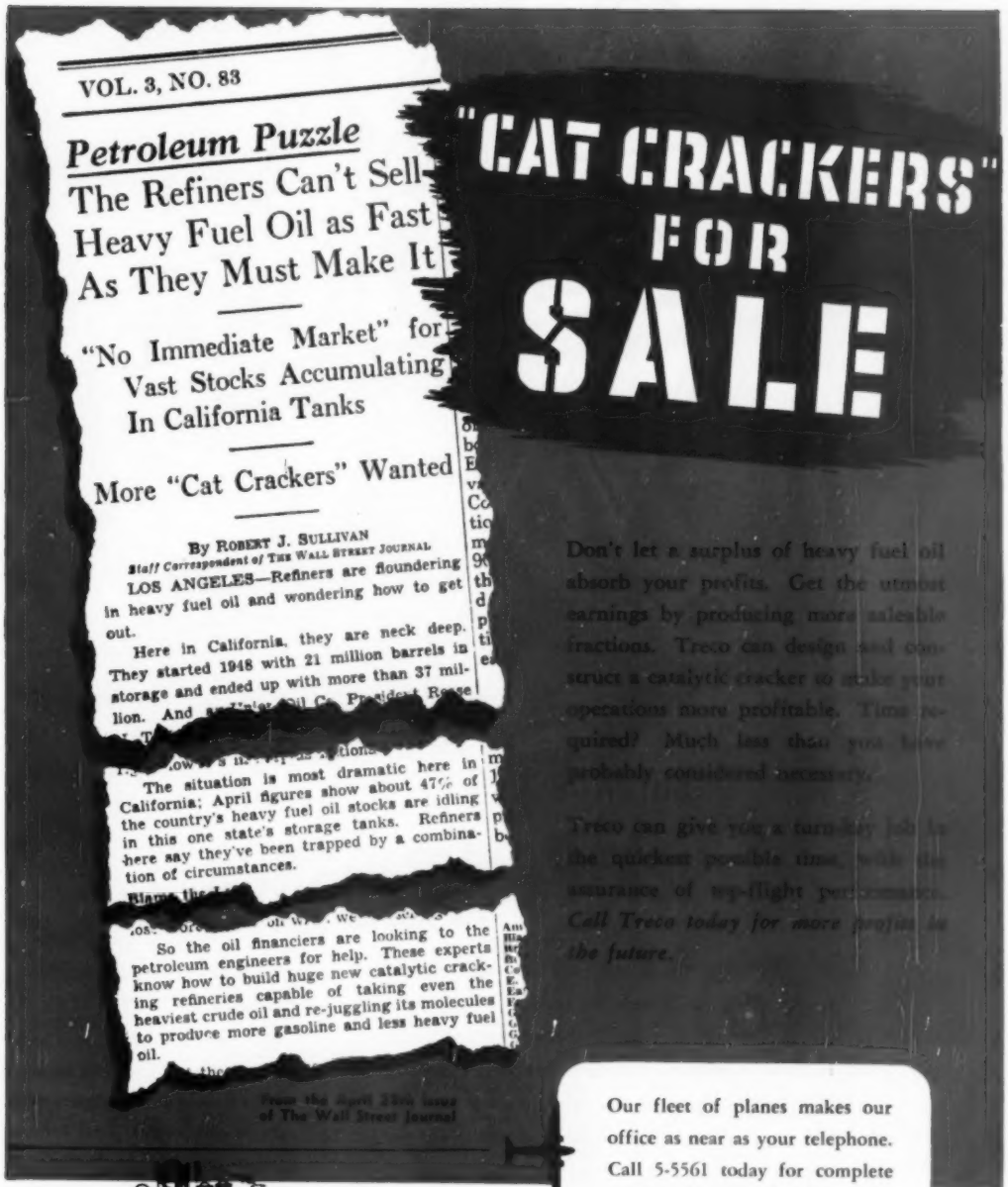
VOL. 3, NO. 83
Petroleum Puzzle
The Refiners Can't Sell Heavy Fuel Oil as Fast As They Must Make It
"No Immediate Market" for Vast Stocks Accumulating In California Tanks
More "Cat Crackers" Wanted
By ROBERT J. SULLIVAN
Staff Correspondent of THE WALL STREET JOURNAL
LOS ANGELES—Refiners are floundering in heavy fuel oil and wondering how to get out.
Here in California, they are neck deep. They started 1948 with 21 million barrels in storage and ended up with more than 37 million. And
The situation is most dramatic here in California; April figures show about 47% of the country's heavy fuel oil stocks are idling in this one state's storage tanks. Refiners here say they've been trapped by a combination of circumstances.
So the oil financiers are looking to the petroleum engineers for help. These experts know how to build huge new catalytic cracking refineries capable of taking even the heaviest crude oil and re-juggling its molecules to produce more gasoline and less heavy fuel oil.
From the April 23rd issue of The Wall Street Journal
"CAT CRACKERS" FOR SALE
Don't let a surplus of heavy fuel oil absorb your profits. Get the utmost earnings by producing more saleable fractions. Treco can design and construct a catalytic cracker to make your operations more profitable. Time required? Much less than you have probably considered necessary.
Treco can give you a turn-key job in the quickest possible time, with the assurance of top-flight performance. Call Treco today for more profits in the future.
Our fleet of planes makes our office as near as your telephone. Call 5-5561 today for complete details without obligation.
TRECO
The REFINERY ENGINEERING Co.
Phone 5-5561 Tulsa, Oklahoma

WORLD PETROLEUM for June, 1949, Vol. 20, No. 6. June, 1949. WORLD PETROLEUM is published monthly by Mona Palmer, Trustee under the will of Russell Palmer, 2 W. 45th St., New York 19, N. Y. Acceptance under the Act of June 5, 1934, at East Stroudsburg, Pa., Authorized September 23, 1946. Subscription rate: $5.00 per year, single copies 50c.

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INTERNATIONAL TRUCKS

Applying Foresight to Problems of Engine Operation

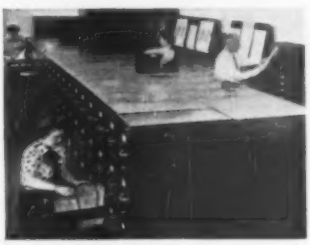
•

Ethyl predicts the performance of fuels and lubricants used in engines operating in field service. This foresight is the foundation of Ethyl's "preventive service" designed to help refiners meet, with a minimum number of fuels and crankcase lubricants, the continually expanding use of gasoline engines, under a wider range of operating conditions.

Frequently, before experimental engines are put into production, the Laboratories subject them to exhaustive tests. If any incompatibility with petroleum products appears, modifications are made until successful results are achieved. Information so obtained is passed along to the engine manufacturers. All the wide variety of Ethyl's varied research facilities, including a cold room (right), are available for such work.

•

As a result of experience gained over more than 26 years, Ethyl Laboratories are able to evaluate petroleum products in respect to the results they may be expected to give in a wide variety of gasoline engines. The performance of many types of gasolines and lubricating oils is continuously observed. If any incompatibility of these products with engines in production is noticed, the results are passed along to the oil companies.



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Many members of the Ethyl Laboratories are authorities on engine-fuel relationships and are always available to engineers of automotive companies for consultation in connection with research programs conducted in their own laboratories. Likewise, Ethyl technologists are glad to discuss with the technical people of oil companies the performance of their products as it is revealed in research programs and in field service.

•

Occasionally operating problems develop in the field because of abnormal conditions which could not be anticipated during the design of the engines. When this happens, the Ethyl Laboratories, having the benefit of specific information supplied by the field organization, work closely with the oil and automotive companies concerned.

•

A further extension of Ethyl's work in the field is the maintenance of contact with the operators of truck, bus and passenger car fleets. Based on field observations and on special research work conducted in the Ethyl Laboratories, recommendations are made to engine users to assist them in obtaining the best engine performance and durability on the fuels and crankcase lubricants used.

Since 1923—*continuous research to provide better antiknock service*

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G. W. Johnson, Party Chief on Crew No. 11, is one of the youngest party chiefs on the Independent staff, yet he has rolled up more than 11 years of geophysical experience on every job in a field party. Among Independent's 17 Party Chiefs the average experience is 13 years.

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POINTING THE WAY IXC FOR THE DRILL

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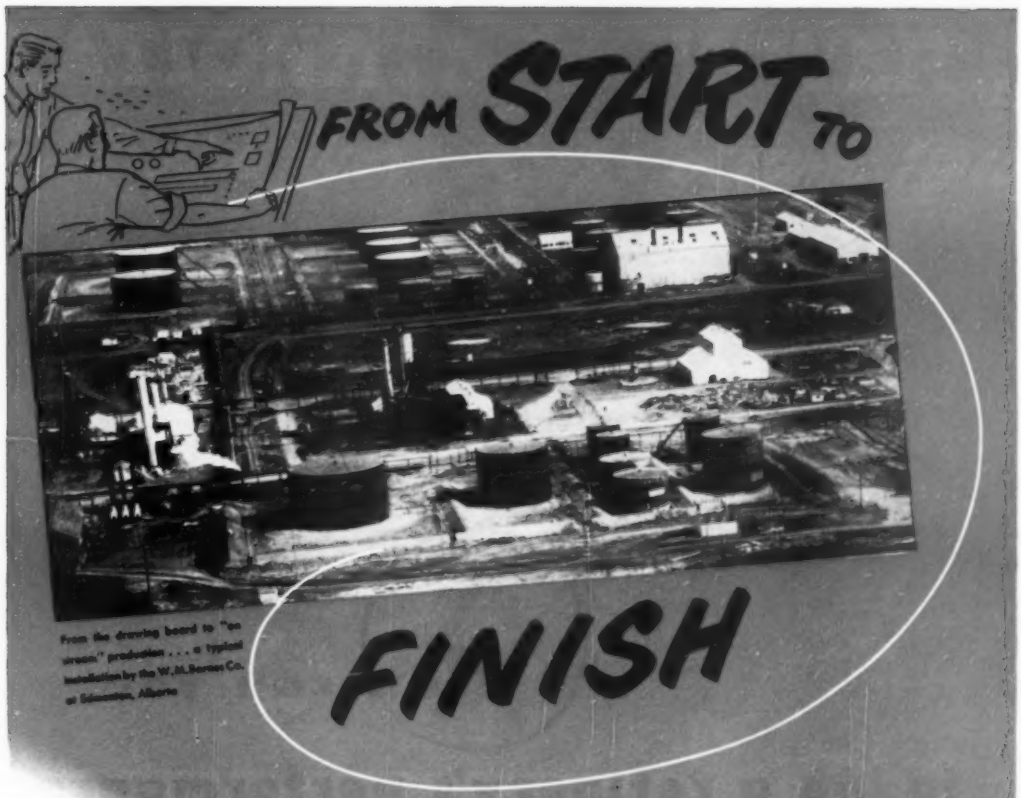
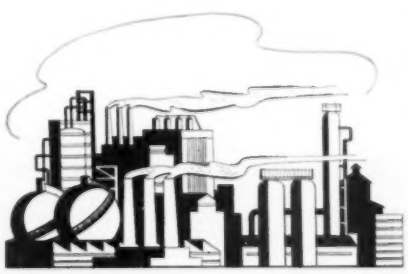


From the drawing board to "on stream" production . . . a typical installation by the W. M. Barnes Co. at Edmonton, Alberta

A complete refinery moved from Whitehorse, Yukon Territory to Edmonton, Alberta, Canada against the most staggering odds . . . Another, from the Los Angeles Basin to Naples, Italy . . . Still another, from Santa Fe Springs, California to Antwerp, Belgium—*and all in record time.*

When you come to Barnes, everything is completely arranged from start to finish —from the carefully engineered drawings to full "on stream" production.

For improved efficiencies with substantial savings on Process Design, Engineering and Construction, investigate our services for your next project.



W. M. BARNES COMPANY

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How can you judge a refinery's performance *before it's built?*

NO INDUSTRY depends to a greater degree on the efficiency of its physical plant than the petroleum processing industry.

Your best indication of the performance of your projected plant lies in the past record and experience of the organization which will design and build it.

McKee's long record of engineering successful processing facilities in all quarters of the globe is safe assurance of the reliable performance to be expected from McKee-engineered plants.

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DESIGN, ENGINEERING AND CONSTRUCTION FOR THE PETROLEUM REFINING AND IRON AND STEEL INDUSTRIES

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NATIONAL'S ANSWER...
to the World's Petroleum Needs

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Since the company was established in 1926, National Tank has devoted its services exclusively to the production end of the oil industry. National Tank Company is now in a position, through their greatly increased modern facilities, to serve the industry in a much broader way. The new facilities will now permit the manufacture of much larger and higher working pressure vessels for gasoline extraction, refining, gas processing, chemical processing and other lines, in addition to all their present products.

Engineering and design is an important part of the services offered. Experienced engineers and draftsmen, as well as shop and fabricating personnel, are available, with modern facilities to carry out such programs.

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SPECIAL EQUIPMENT HAS BEEN INSTALLED TO INSURE QUICK DELIVERY OF ALL VESSELS:

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A color brochure has been prepared describing in detail this new plant, which is located on a 36½-acre site.
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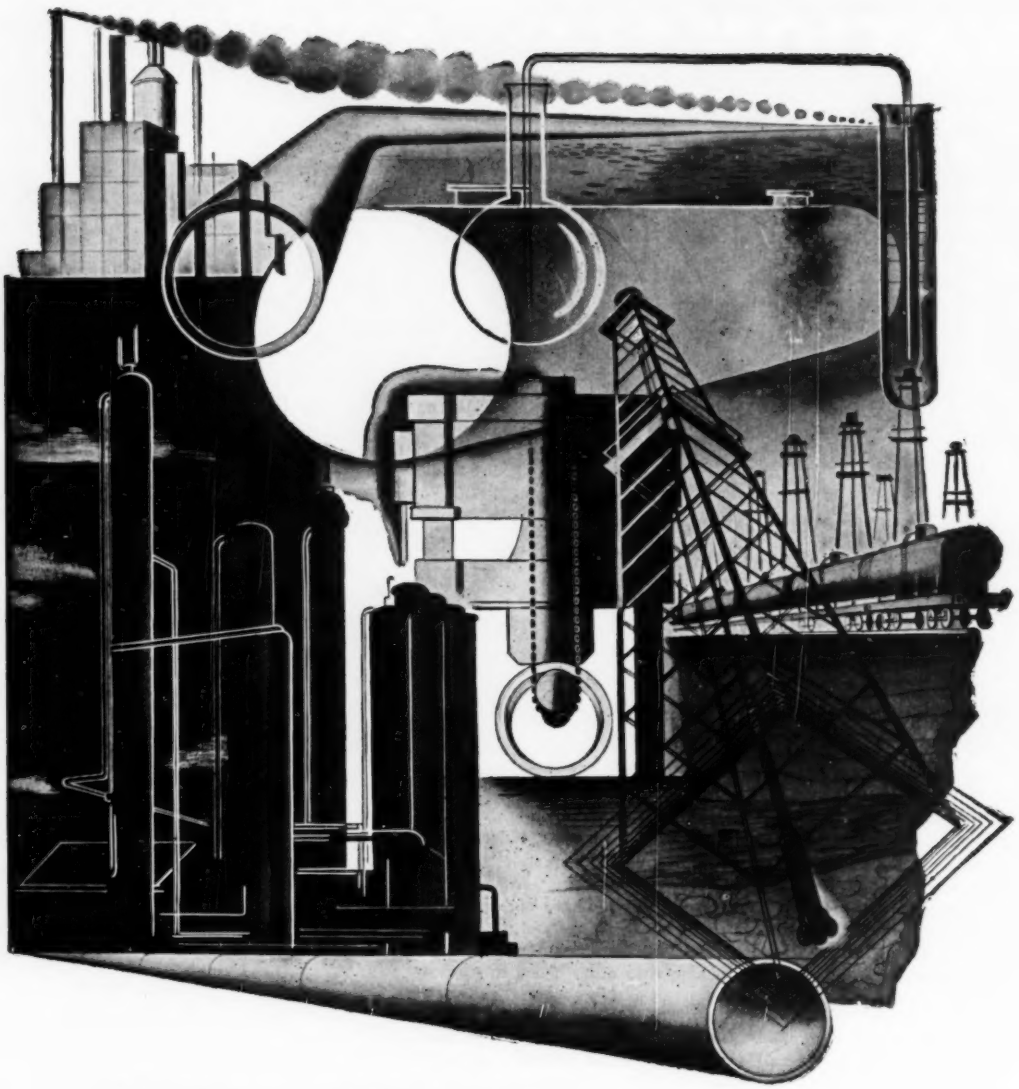
TULSA, OKLAHOMA.



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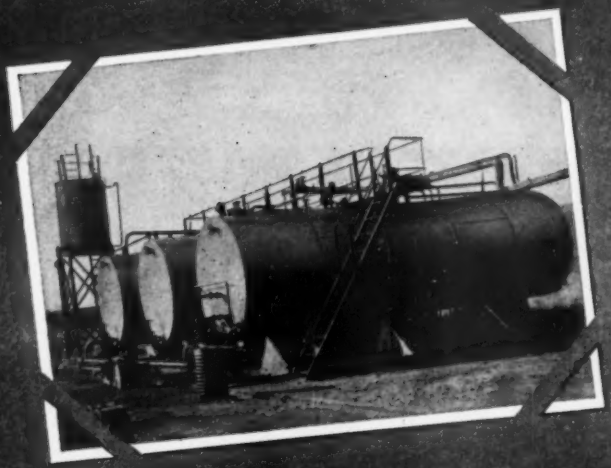
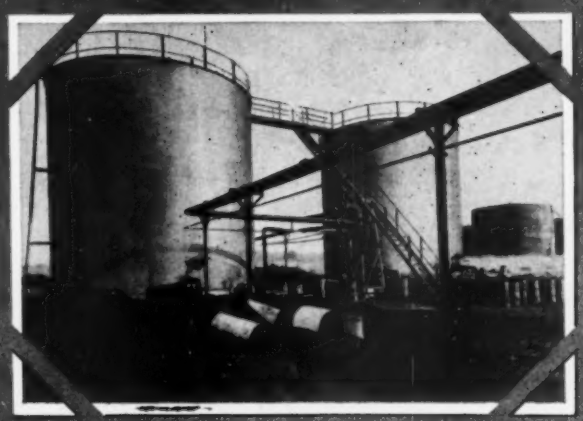
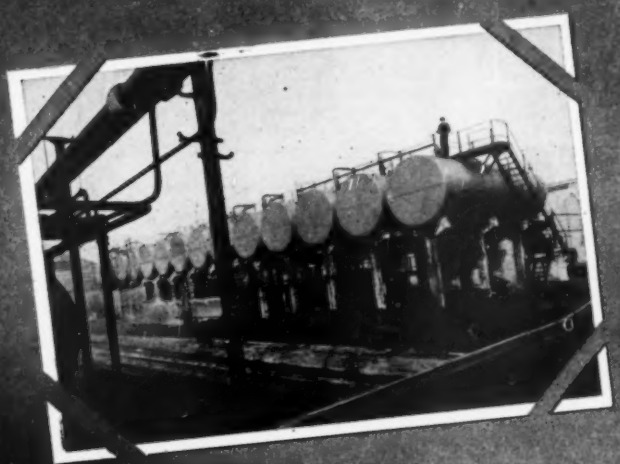
A PAGE FROM OUR ALBUM OF OXLEY INSTALLATIONS

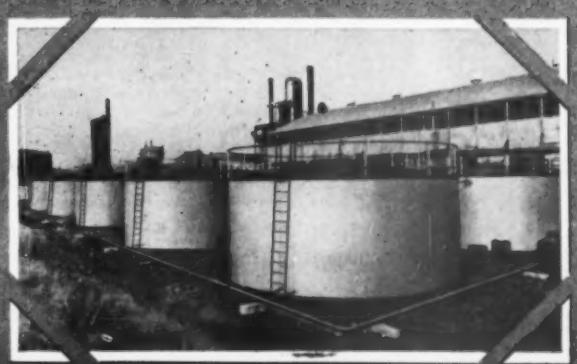




OXLEY WELDED STORAGE TANKS

for the Lobitos Oilfields Ltd.





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N.B. While it is axiomatic that return on investment—the *ultimate earning power* of a refinery unit when actually on stream—is the only true evaluation of competitive engineering recommendations, initial plant costs remain a major factor in refiners' decisions on plant installations. M. W. Kellogg takes specific steps to *minimize initial plant costs* consistent with the achievement of *highest ultimate earning power*.

A THREE-WAY PIPE STORY!

Consider for a moment that piping accounts for about one quarter of the cost of the average installation.

That can put piping in the million and often multi-million dollar class. If savings of from 10 to 20% can be effected, refiners will realize important economies, particularly attractive in these days of high costs.

Of course, accurately computing specific savings on a piping job is virtually impossible. There are too many variables. But Kellogg today estimates that its methods of field fabricating lop upwards of 15% off the cost of refinery piping work.

Here's why.

First, pipe is bent on the site as needed. No waiting for key pieces to arrive. Even one day saved over the course of the entire job represents a sizable sum both in labor savings and in the refiner's operating revenue.

Second, the shop overhead of the plant where such pipe would normally be fabricated, is dispensed with entirely.

Third, Kellogg's own crews handle the piping fabrication in the field, hiring necessary supplementary craft labor on an hourly basis. Thus there are no sub-contractors' fees pyramiding on the cost of the job.

There are still other advantages such as savings in shipping straight pipe rather than space-consuming, odd shapes, and they all add up to money in the bank for the owner.

Kellogg's development of field fabricating techniques sounds rather obvious and certainly simple when explained this way—but it wasn't. The move required that shop equipment be duplicated in mobile form, that shop techniques and quality standards be duplicated under field conditions subject to both the weather and the physical idiosyncracies of each job site.

Such an operation as this is only possible when backed, organized and controlled by a *complete* organization—such as that of M. W. Kellogg—where all types of specialists are available for handling the myriad problems involved. These savings effected in field fabrication of piping provide further proof that *completeness and integration of the engineer-contractor* are the keys to LOW INITIAL PLANT COST.

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A SUBSIDIARY OF PULLMAN, INC.

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Perfect Performance

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MOTOR OIL

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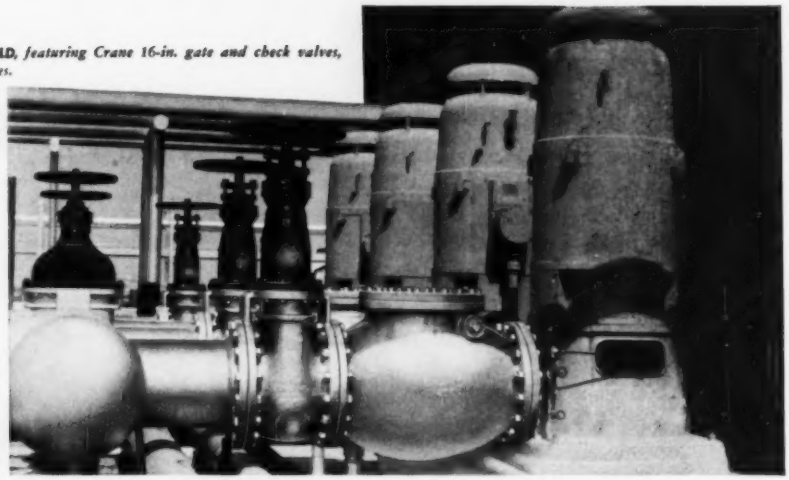
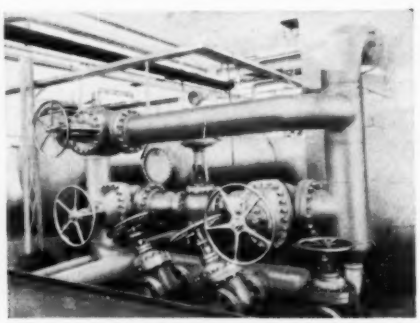
COOLING TOWER MANIFOLD, *featuring Crane 16-in. gate and check valves, pipe and pipe line accessories.*



Nothing finer in refinery piping . . . and from one complete line

ONE SOURCE OF SUPPLY
RESPONSIBILITY
STANDARD OF QUALITY



ONE ORDER TO CRANE *covers all piping materials for recycling plant processing systems, for example.*

For proof, just pick up your Crane Catalog the next time you're looking for piping equipment. There you'll find the world's most comprehensive selection of valves, fittings, pipe and accessories . . . all conforming to rigid refinery specifications. One order through local Crane Branches or Wholesalers covers everything, for power, processing or general service installations.

To get widest benefit from standardization practices, it pays to rely on Crane—the **ONE Source of Supply** complete enough to simplify every piping procedure. You get better installations and avoid needless delays when you put **Complete Responsibility** on Crane for materials. And for **High Quality** in every item that assures dependable piping performance—get Crane Quality, unsurpassed for more than 90 years.

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VALVES
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PIPE

CRANE

PLUMBING
AND
HEATING

FOR EVERY PIPING SYSTEM

ACID TEST of Performance

...never two problems exactly alike

A successful record in the refinery field is a reliable measure of engineering and construction ability.

Problems of design, as well as those of supply and field organization, yield readily to experience.

The wide variety of oil processing plants engineered and built by Bechtel refinery men show how well the organization is manned and equipped for this type of work—in any size, at any location the world over.

Bechtel Corporation takes complete responsibility, from preliminary study to operating plant.

BUILDERS FOR INDUSTRY
BECHTEL

BECHTEL CORPORATION

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Almost every requirement for steel windows, commercial, industrial, institutional, or residential, can be met with Truscon's wide range of types and sizes. All Truscon windows incorporate the latest advances in construction and design.

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Steel Doors

Many types of industrial and airplane hangar steel doors are manufactured by Truscon, including Swing and Slide doors, Crane doors and Vertical Lift doors. All are durably made for heavy usage and lasting ease of operation.

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World's Largest Manufacturer of Steel Building Products

Over four decades of construction and building experience, combined with an intimate knowledge of all kinds of steel building materials, particularly equip Truscon to render a complete building service. You are invited to discuss your requirements with our local representative —or write the Export Department, Truscon Steel Company, Subsidiary of Republic Steel Corporation, Chrysler Building, New York City.

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Company *Subsidiary of*
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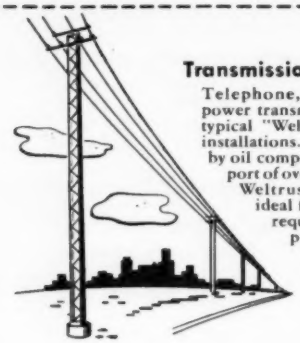
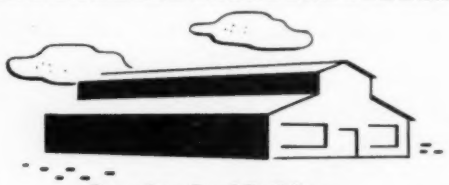


Transmission Steel Poles

Telephone, telegraph and power transmission lines are typical "Weltrus" Steel Pole installations. They are used by oil companies for the support of overhead pipe lines. Weltrus Steel Poles are ideal for all conditions requiring easy transportation and long, trouble-free service.

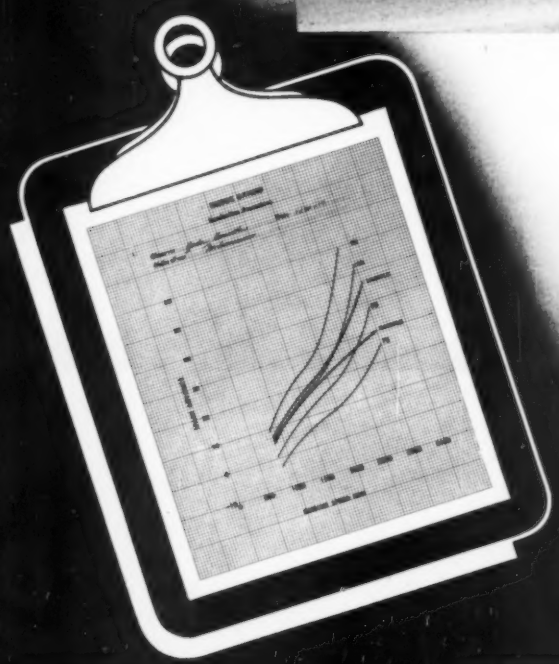


Complete Steel Buildings

Constructed of standardized fire-resistant units, manufactured entirely in the Truscon plant, with all the economies of quantity production. Truscon buildings are furnished in all lengths, widths and heights . . . with pitched, flat, monitor, lantern and saw-tooth roofs.

DU PONT TETRAETHYL LEAD COMPOUNDS

Fleet of antiknock rating cars from the East Coast Road Test Laboratory enroute to testing area.



Du Pont Research

Road Testing for Fuel Performance

Combustion knock is one of the most important factors limiting development of improved engines. While laboratory test methods provide a measure of fuel knocking characteristics, the final criterion of a fuel's worth is its performance in a car on the road. For that reason, road testing plays an important part in the Du Pont research program on tetraethyl lead and other antiknock agents.

To provide a complete evaluation of fuels and additives under a wide variety of road conditions, Du Pont maintains road testing facilities on both the East and West Coasts. Cars of the East Coast Laboratory weekly roll up thousands of miles studying fuel performance in both stock passenger cars and cars equipped with experimental high compression ratio engines.

The Road Test Laboratory is used by Du Pont to evaluate motor car fuel needs and to proof-test the experimental additives which come from chemical research. This is research aimed at helping you produce better fuels—today and in the future.

Drivers compare notes between test runs.

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

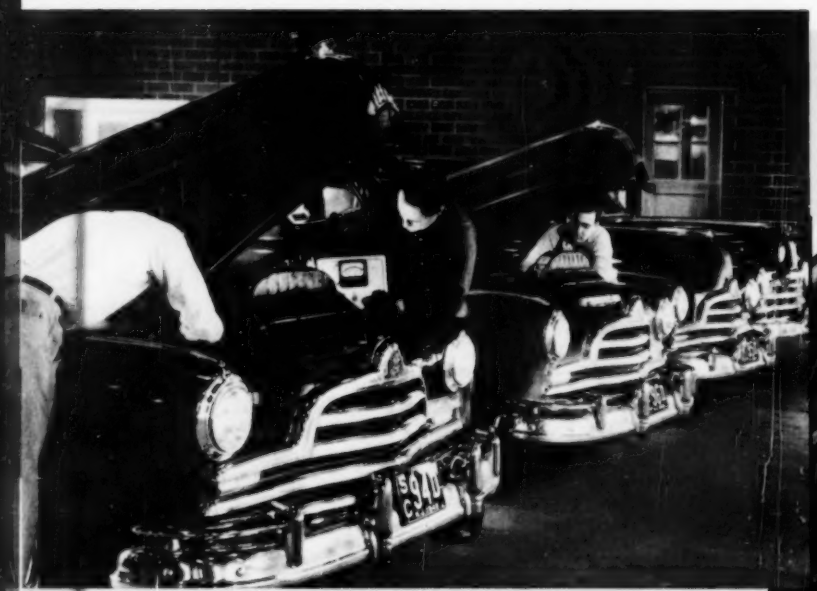
Measuring

Fuel Performance in Today's and Tomorrow's Engines

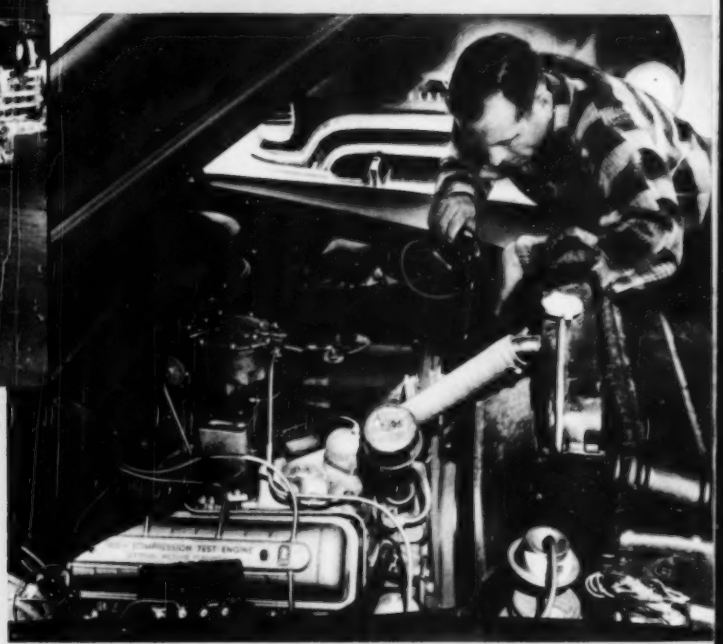
It is well known that fuels of different chemical types have markedly different "octane numbers" under different engine conditions. When compared with laboratory ratings, some fuels appreciate in octane value on the road while others depreciate. The numerous factors affecting fuel performance such as operating conditions, vehicle and engine design and many others are being investigated by the East Coast Laboratory through extensive road anti-knock and endurance testing.

Another project is an investigation of the effect of experimental high compression ratio research engines on fuel performance. These are installed in test cars and are being used in the study of fuel requirements.

Information developed through road testing will contribute to improved additives and fuels, today and in the future.



For comparative service and endurance tests on fuels identical cars are used. Here a group is being serviced prior to a run.



In addition to stock passenger cars, cars equipped with experimental high compression ratio research engines are used to study fuel performance. This 10 to 1 ratio engine is being checked during a road test.

MAKE DU PONT THE SOURCE FOR ALL OF YOUR GASOLINE ADDITIVES . . .

Tetraethyl Lead Compounds
Motor Mix—Aviation Mix
Antioxidants
Metal Deactivator — Dyes

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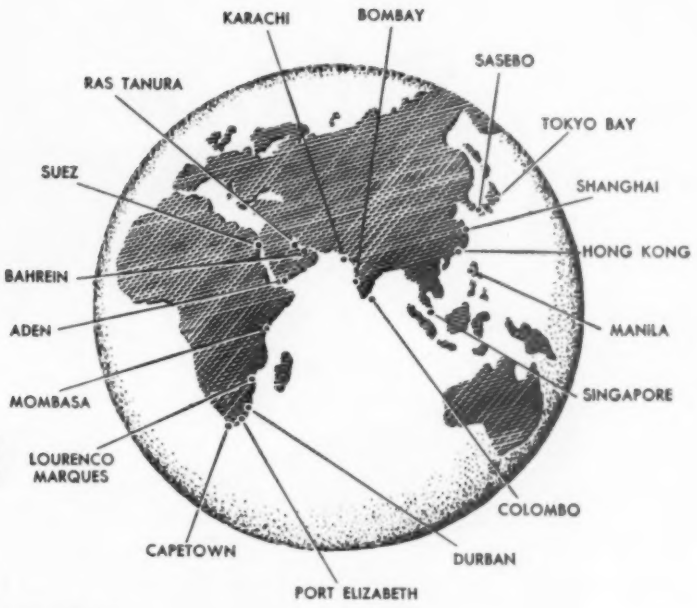
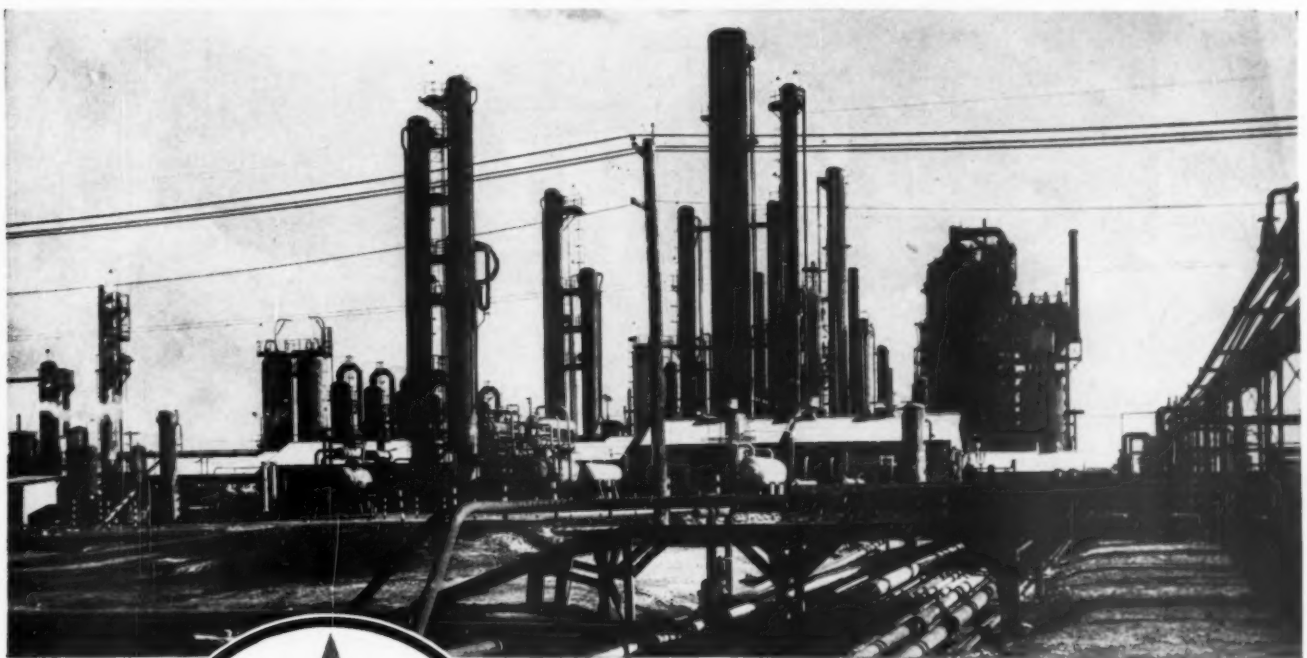
MARINE FUELS
East of Suez



Section of Refinery at Bahrein, Persian Gulf—one of the many Caltex installations . . .



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America Needs '49ers

JUST a hundred years ago, the Forty-niners stormed the gold fields of California. They faced staggering obstacles, sure hardship, uncertain reward. Thousands failed, thousands of others realized modest gain, a few made fortunes. None sought or received help or direction from a benevolent government.

Now a century later, America faces another age of golden opportunity--an era when science and industry reveal new treasure to be had for the making. Turning today's visions into reality calls for '49ers--men of purpose and resolution, courage and independent spirit. You as a leader in your community may find a personal challenge and an inspiration in the Old '49er. By example and precept, you can help America toward her greatest accomplishments--in prosperity and peace.

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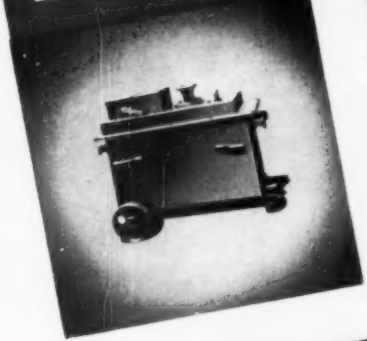
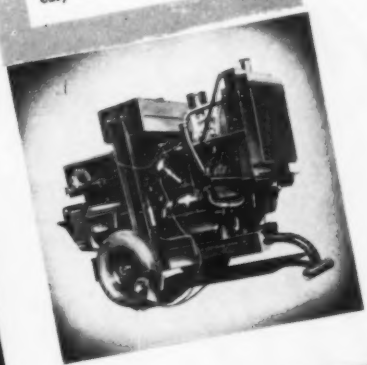
A.C.P. 300
Oil-cooled combined regulator and transformer, suitable for one operator using current from 20 to 300 amperes.
Mains Voltages : 175/550
Welding Voltages : 80 and 90



P.E. 250
Lightweight, readily portable 250 ampere set with Austin 4 cylinder petrol engine developing 20 B.H.P. at 2,200r.p.m. The generator and engine units are quickly detachable for easy lifting by four men.



D.E. 300
New 300 ampere single operator dual control generator driven by 2 cylinder cold starting Ruston Hornsby diesel engine of 22·5 B.H.P. The generator is of special design having independent voltage and current regulation.

A.C.M. 300
Oil-cooled regulators and transformers for 3, 6 or 12 operators. 30 to 600 amperes for each operator.
Mains Voltages : 400/550, 3 phase.
Welding Voltages : 80 and 100

Whether for use in workshop or field, Quasi-Arc Welding Equipment is available in a variety of types and sizes. The welding sets illustrated are a selection from our extensive range of A.C. and D.C. sets. Quasi-Arc welding equipment has been paramount in the Welding Industry for over thirty years and is backed by sound experience in all classes of electric arc welding. They are designed to afford the maximum flexibility to the user and at the same time function at the highest efficiency, reliability and lowest operational cost. For use with this comprehensive range of first class sets, Quasi-Arc provide their well-known arc welding electrodes specially designed to meet all the requirements of the welding industry.

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FACT 1 Mercaptan *removal* is today's answer to deodorization problems.

FACT 2 Modernizing with the *Tannin Solutizer Process* for mercaptan removal yields "new refinery" economics in treating and blending your finished leaded gasoline.

FACT 3 *Conversion and operating costs* are extremely low.

FACT 4 The Tannin Solutizer Process is not *corrosive.*

FACT 5 The high efficiency of the Tannin Solutizer Process has been conclusively demonstrated during more than *five years* of commercial refinery operation.

FACT 6 The Tannin Solutizer Process does not affect the *stability* of the gasoline treated.

FACT 7 Complete Tannin Solutizer *process engineering* service is available—during the planning of your unit, at start-up, and thereafter if required.

We will welcome the opportunity to work with you on your specific problem. The Tannin Solutizer Process is licensed under the patent rights of Socony-Vacuum Oil Company and Shell Development Company.

SHELL DEVELOPMENT COMPANY, INCORPORATED
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SHELL

Baroid

Non-Caking Organic Mud Thinners...

CARBONOX

TANNEX

CARBONOX, Baroid's new organic mud thinner, provides an excellent means of thinning and reducing the gel strength of drilling muds. It may be used for the same purposes for which quebracho is used. Many operators use it successfully to treat normal pH muds, high pH Impermex muds, and high pH lime muds. CARBONOX requires less caustic soda than does quebracho to treat normal pH muds, the usual treatment being made in the proportion of 10 pounds of caustic soda to 50 pounds of CARBONOX. Muds treated with CARBONOX offer unusual resistance to contamination by salt water.

TANNEX is a full substitute for quebracho. It can be used wherever quebracho is used, and in exactly the same manner. Both compounds show continued mud thinning efficiency even when exposed to high bottom-hole temperatures. Neither of these powders, unlike quebracho, has any appreciable tendency to lump, cake, or turn hard, nor will spoilage occur in storage.

Baroid Sales Division, Department A-8
P.O. Box 2258, Terminal Annex, Los Angeles 54, Calif.

Send me detailed information on CARBONOX and TANNEX organic mud thinners

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COMPANY TITLE

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BAROID SALES DIVISION
NATIONAL LEAD COMPANY
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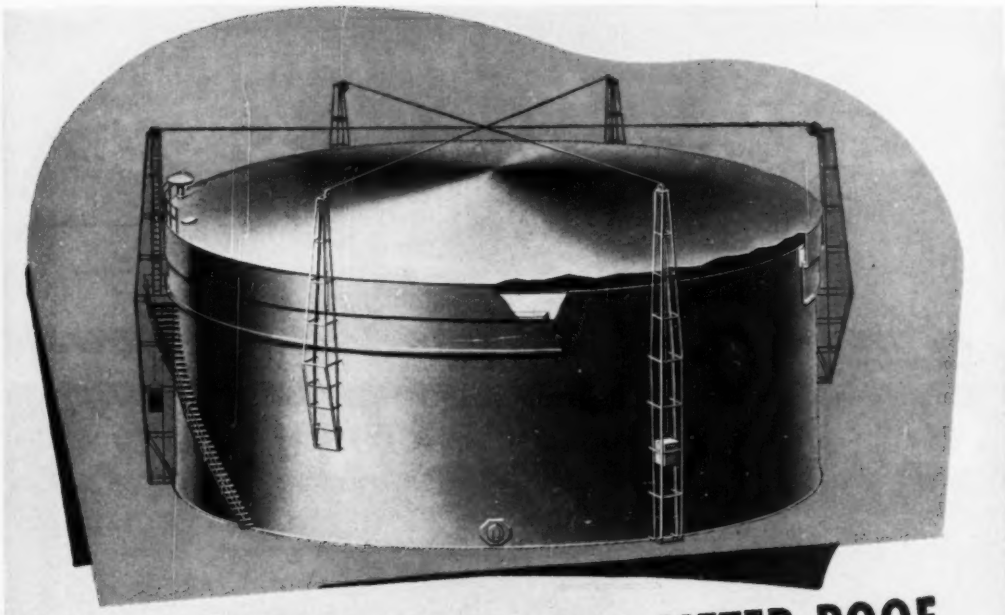

THE WIGGINS DRY SEAL LIFTER ROOF

. . . can be used to conserve the vapors of a single tank, on which it is installed, or it can serve as a vapor balancing unit of several interconnected tanks.

ADVANTAGES

THE SEAL	**1 — 100% dry seal eliminates corrosion, heating and freezing problems.** **2 — No maintenance other than periodic inspection required.** **3 — No possibility of stored product being absorbed in seal and creating a fire hazard.** **4 — Out-of-level tank grade does not affect seal operation.**
COUNTER BALANCE SYSTEM	**1 — Reduces operating pressure to 1 3/4 water.** **2 — Reinforcement of interconnected tanks not required.** **3 — All mechanism completely accessible from outside.** **4 — Not affected by out-of-level tank grade.** **5 — No lubrication required.**
PRESSURE VACUUM RELIEF	**1 — No leakage, absolutely gastight.** **2 — All working parts outside tank and readily accessible for inspection.** **3 — Simplicity. Single valve serves for both pressure and vacuum relief.**

For further details, write for a copy of Bulletin VB-10.

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Each New Pipeline is a Promise

Promise of Bigger Crops . . . *To increase their harvests, farmers today are using more trucks, tractors and other mechanized equipment—all of which require petroleum.*

Promise of Greater Comfort . . .

Petroleum plays an ever more important part in the home. It is used for heating and cooking—also as the base for many paints, preservatives and insecticides.

Promise of Better Transportation . . .

More and more petroleum is needed for fuel and lubrication by increasing numbers of buses, trucks, motor cars, trains, planes and ships.

The world's consumption of petroleum has reached an all-time high—*9 million barrels each day.* And the demand is still rising. To help meet it, Standard Oil Company (New Jersey) and its affiliated companies are engaged in a world-wide construction program.

New pipelines are being planned—hundreds of miles long. Just one of them will carry more than 535,000 barrels of oil a day. It will be the largest capacity crude oil pipeline ever built—34 to 36 inches in diameter. New refining and storage facilities are being constructed. Tanker fleets are being expanded.

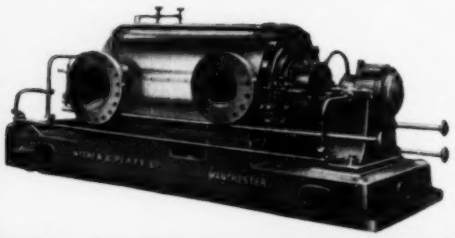
This huge construction program is necessary to manufacture and deliver the petroleum products required in homes, on farms and on the highways. When completed, it will bring greater comfort and convenience to everyone, because . . .

The better you live, the more oil you use . . .

STANDARD OIL COMPANY (NEW JERSEY)
AND AFFILIATED COMPANIES

Centrifugal Pumps & FLAMEPROOF MOTORS

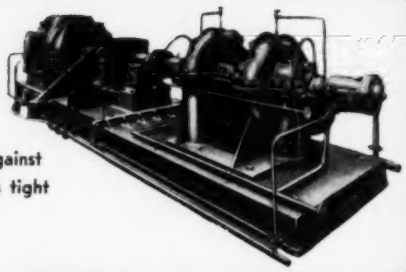
Main Pipeline Pumps....



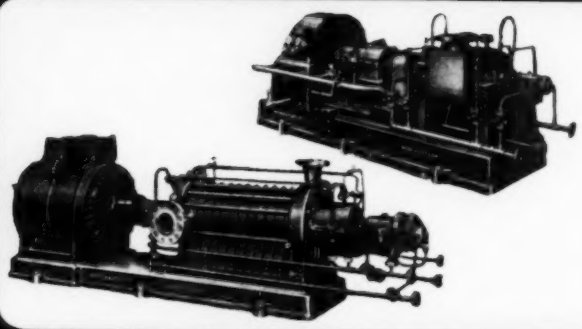
Mather & Platt multi-stage 'Plurovane' pumps were amongst the earliest centrifugal pumps installed for main line work. The pump shown on the left is a typical modern 'Plurovane' designed for a throughput of 50,000 bbls/day of crude oil against a pressure of 750 p.s.i. when running at 1500 r.p.m.

Transfer and Loading Pumps

Our standard ranges include a pump for nearly every transfer or loading duty. The two-stage "Medivane" pump illustrated on the right can handle 700 tons/hr. of crude or products against heads up to 500 ft. It is driven through a gas tight wallbox by a 550 h.p. Mather & Platt Motor.



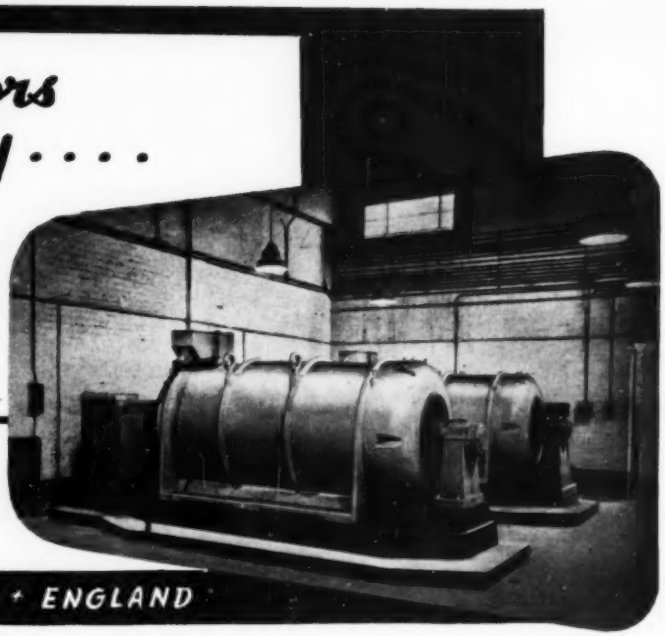
Refinery Process Pumps



Our long refinery experience at home and abroad enables us to supply pumps for the most arduous refinery duties. The illustration shows typical units:—a steam turbine driven pump handling oil at 500 degs. F. and a motor driven "Plurovane" pump dealing with light volatile hydrocarbons.

Flameproof Motors on Pipeline Duty....

Mather & Platt electrically-driven centrifugal pumps on an oil pipe line. The motors here illustrated are of the totally enclosed flameproof type, and are of 1,000 h.p. capacity, fed from a 3 phase 50 cycle 6000/6600 volt supply. They are squirrel cage direct-on started machines with a starting current of four times full load value.



MATHER & PLATT

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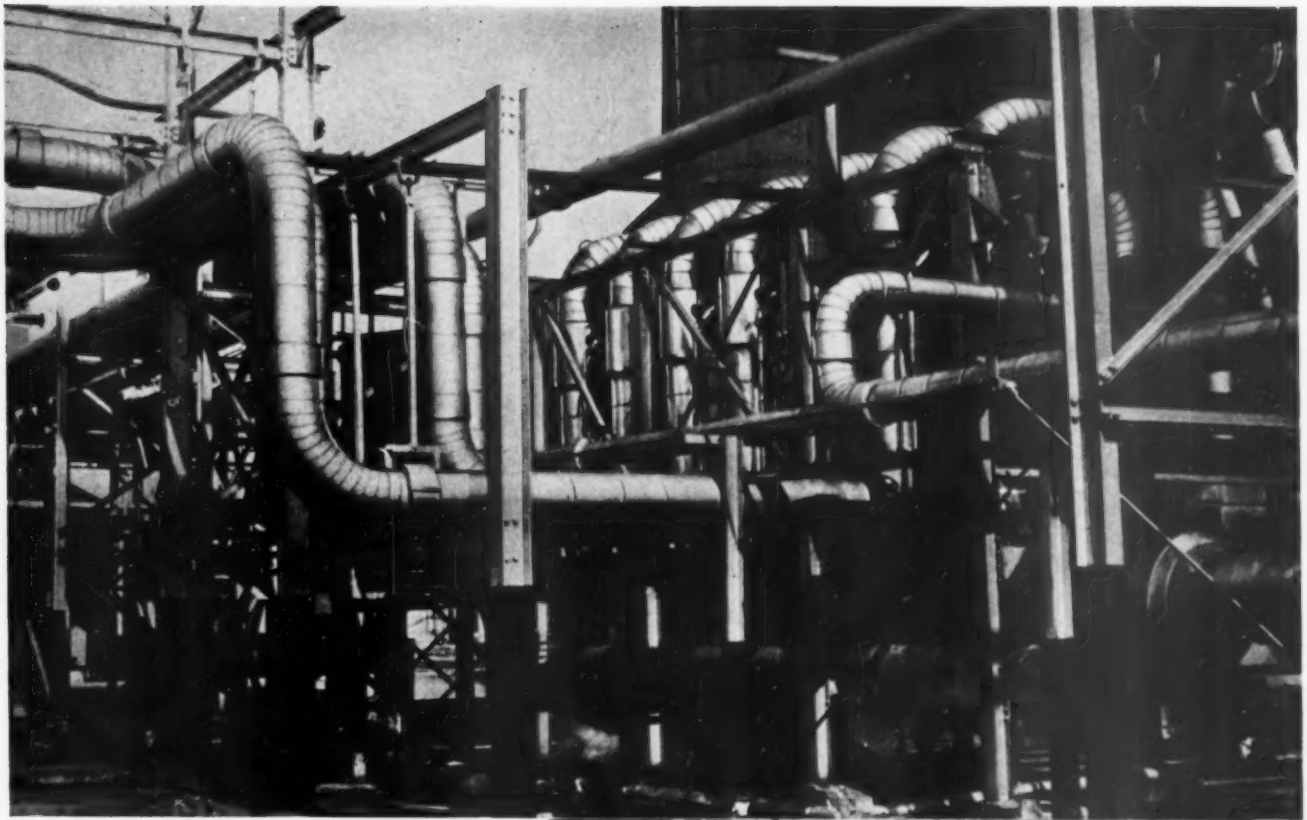

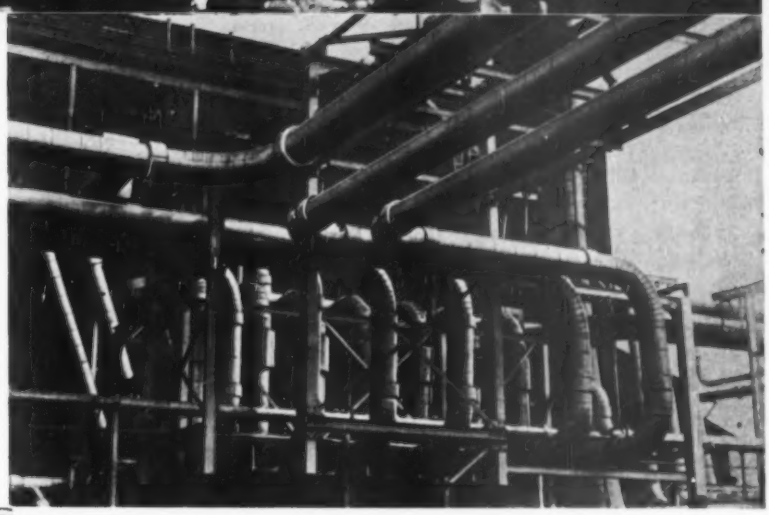

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Light & Power

Soaring Demand Brings Record Expansion in Electricity Production

From
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An $8,500,000,000 Investment

By Robert H. Selltitz

Electrically minded Americans have nged the nation's electricity makers into biggest power expansion program the d has ever seen.

umbnail measures of its magnitude: to U. S. power making facilities ar 1939 are by themselves greater ombined generating capacity of Great Britain. New capacity completed in the next three es as much as has been tricity was discovered. rdstick: The $8.5 ty-making com- spend on ex- period is penditure rogram, spent over World

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The Wall Street Journal, February 21, 1949

10%

The power generating facilities designed and constructed by Stone & Webster Engineering Corporation through the years total over 6,000,000 kilowatts, equivalent to one-tenth of the total generating capacity of all electrical utilities in the United States.

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STONE & WEBSTER ENGINEERING CORPORATION

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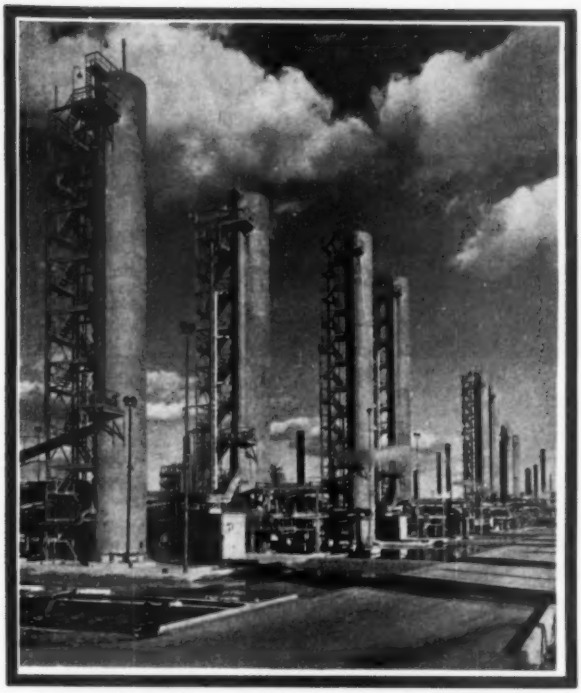

(Photograph by courtesy of Anglo-Iranian Oil Co., Ltd.)

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For Refinery Service

Thousands of "ALLEY" Valves have been supplied to Refinery installations serving the requirements of the Oil Industry.

Designed in accordance with the latest British and American Oil Valve Specifications.

Made for all classes, sizes, pressures, and temperature ratings.

Illustrations, above:—Super-Fractionators for preparation of aviation fuel at Abadan Refinery, South Iran.

Right:—Class 300 "ALLEY" Globe Stop Valve with Stainless Steel trim.

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for PETROLEUM REFINERIES

The Technique, the Plant and the Experience which are necessary for the production of Special Alloy Steel Castings, as the typical example illustrated, are at your service for collaboration on your particular problem.

Catalogue 'Carbon & Alloy Steel Castings' will be sent to all applicants writing from business addresses.

STAINLESS STEEL REFLUX COLUMN FOR HOT SO_2 DISTILLING PLANT IN 18/8/4 CHROMIUM-NICKEL-MOLYBDENUM STEEL WORKING PRESSURE 75 lb./sq. in. HYDRAULIC TEST PRESSURE 150 lb./sq. in. WORKING TEMPERATURE 250° F.

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PROPRIETORS: DAVID BROWN & SONS (HUDDERSFIELD) LTD
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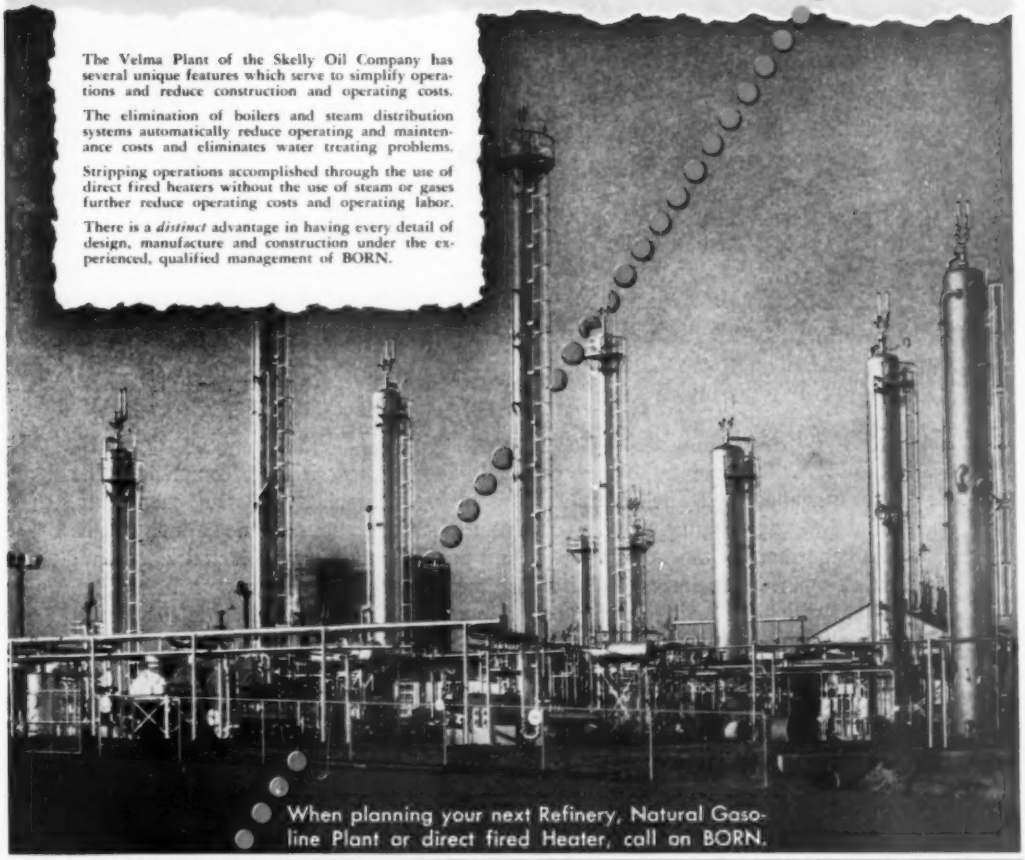
The Velma Plant of the Skelly Oil Company has several unique features which serve to simplify operations and reduce construction and operating costs.

The elimination of boilers and steam distribution systems automatically reduce operating and maintenance costs and eliminates water treating problems.

Stripping operations accomplished through the use of direct fired heaters without the use of steam or gases further reduce operating costs and operating labor.

There is a *distinct* advantage in having every detail of design, manufacture and construction under the experienced, qualified management of BORN.



When planning your next Refinery, Natural Gasoline Plant or direct fired Heater, call on BORN.

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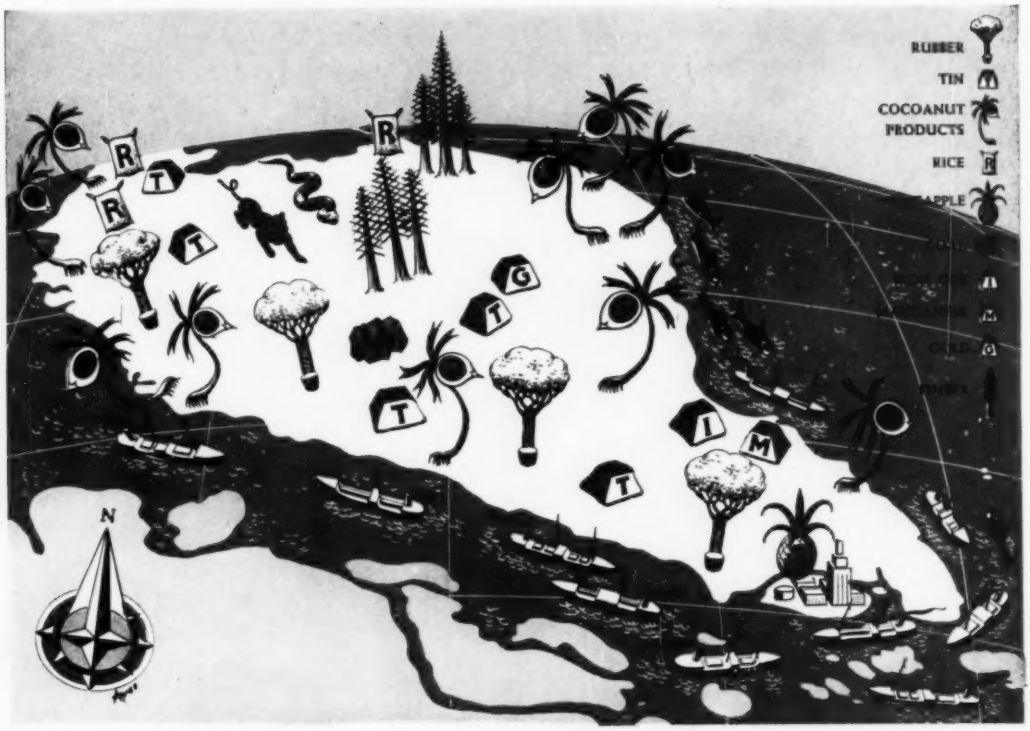
Canadian Associates: CANADIAN BROWN STEEL TANK CO., LTD., Brandon, Manitoba

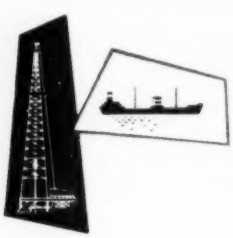


MALAYA

MALAYA . . . The tropical Malay peninsula and adjacent islands, comprising The Colony of Singapore and The Federation of Malaya, is amazingly colorful, enchanting, and productive. Its green jungle-clad mountains, rubber plantations and rich alluvial plains provide a large share of the world's rubber and tin; its natural wealth includes cocoanut products, rice, pineapple, timber, coal, iron ore, manganese and gold; its surrounding blue seas abound with fish. Living in friendly harmony with the hospitable Malays in this equatorial clime are Chinese, Indians, Burmese, Siamese, Indonesians and Occidentals from many countries.

SINGAPORE, the focal point of the verdant peninsula, with its teeming harbor rated among the world's ten most important, is truly the "Crossroads of the East." Through this great clearing house of Southeast Asia flows commerce in endless variety.

STANDARD-VACUUM is proud of the part it plays in supplying Malaya with the petroleum products so essential to its welfare and continued growth.



STANDARD-VACUUM OIL COMPANY

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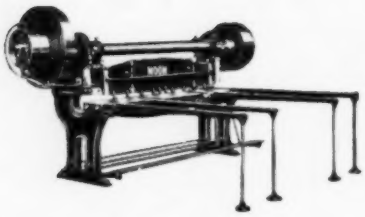
Harveys the answer!

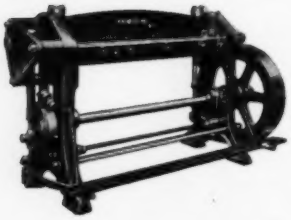
Because Harveys have one of the most modern and complete plants in the world, housing up-to-date welding equipment, operated by an experienced staff, they can supply the answer to even the most complicated plate-work problem. Fabricating mild, alloy, or clad steels they can produce installations to any of the recognised codes, including Lloyds, and A.P.I.-A.S.M.E. with, if necessary, X-ray examination and stress-relieving by heat treatment. Shop assemblies range from a few inches to 15′10″ in diameter; pressures from absolute to 3000 lbs. per sq. in.

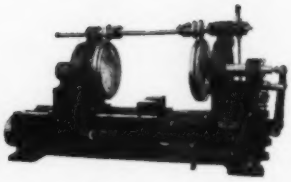
Harvey

This illustration conveys but an impression of flash Fractionating Towers that Harveys have been producing for their overseas customers. Recent orders include Vessels 110 ft. high by 25 ft. in diameter, weighing up to 125 tons.
Send for Catalogue WP. 750.

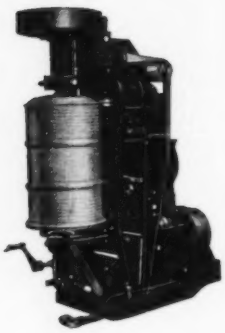
G.A. Harvey & Co. (London) Ltd., Woolwich Rd., London, S.E.7.







The team to back for
DRUM MAKING!
and all types of oil containers



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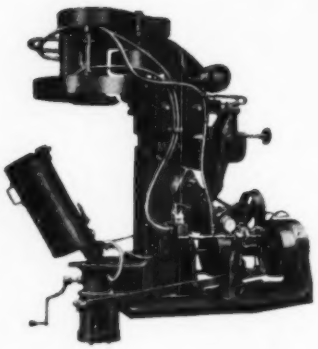

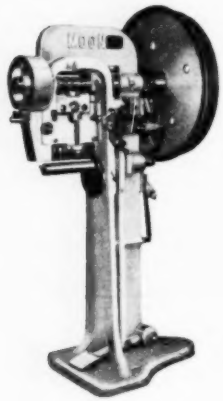

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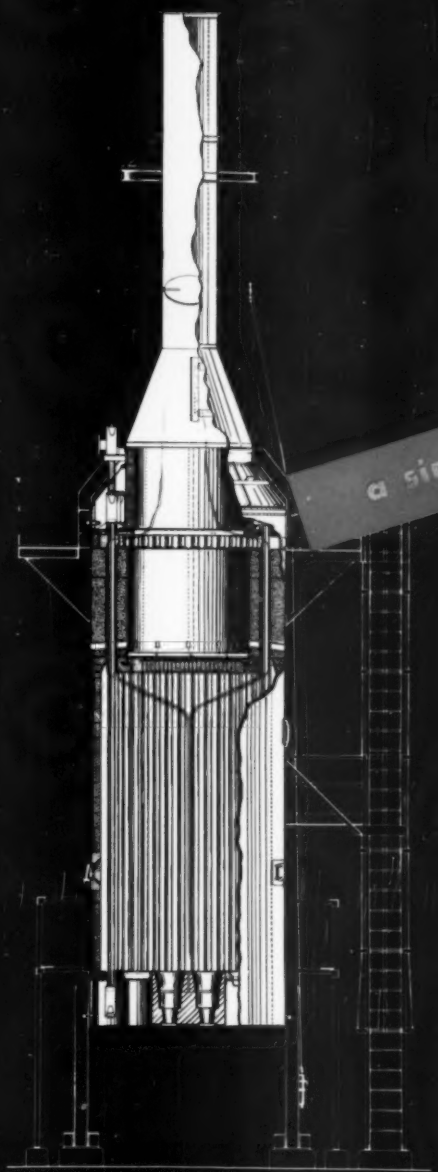

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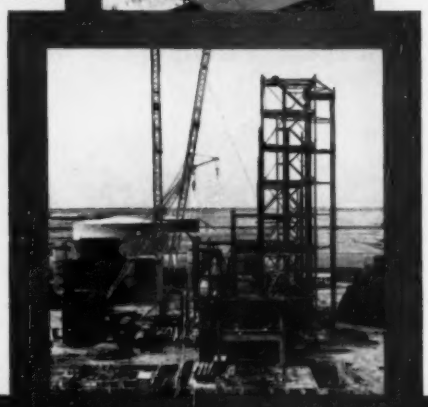

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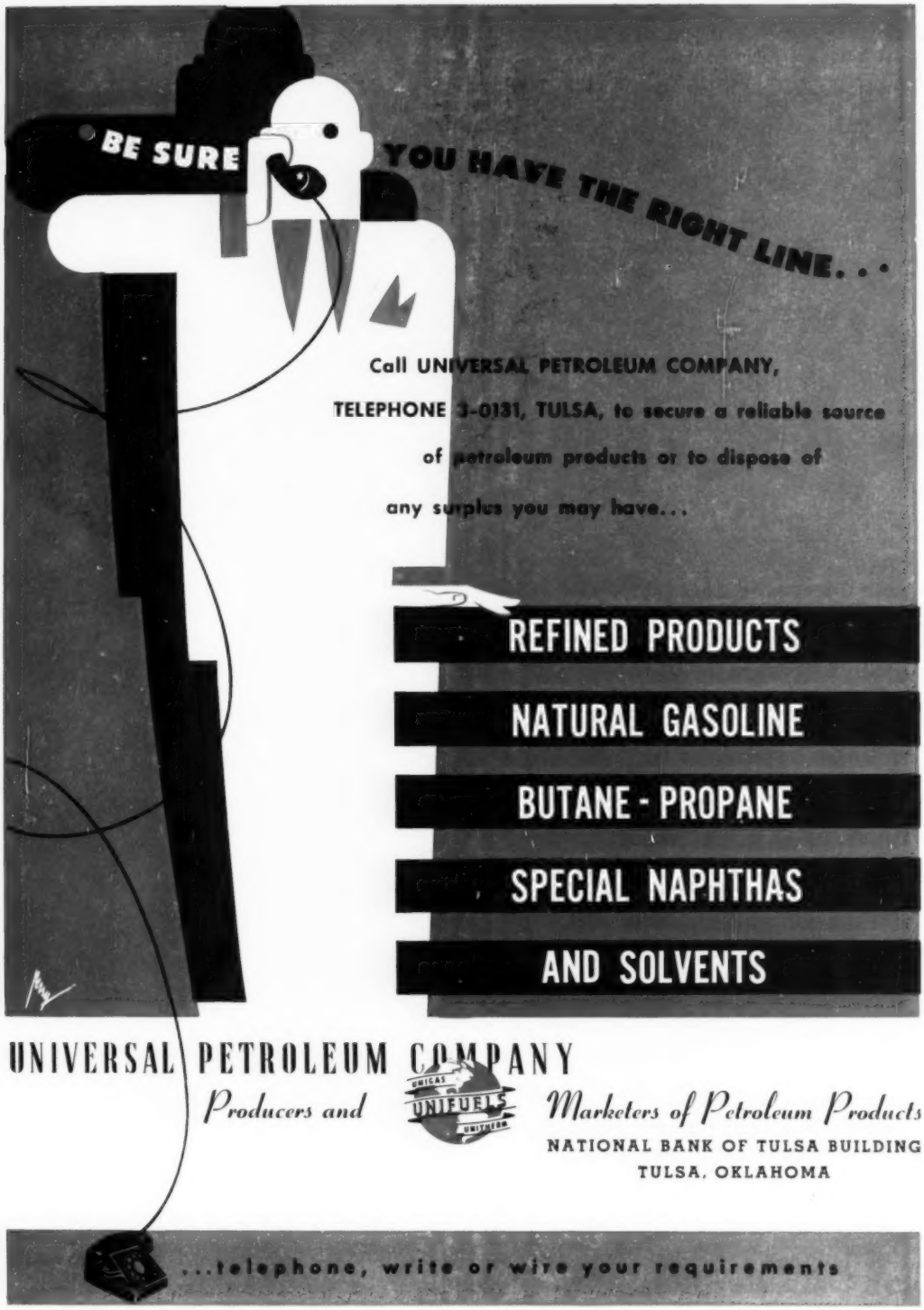
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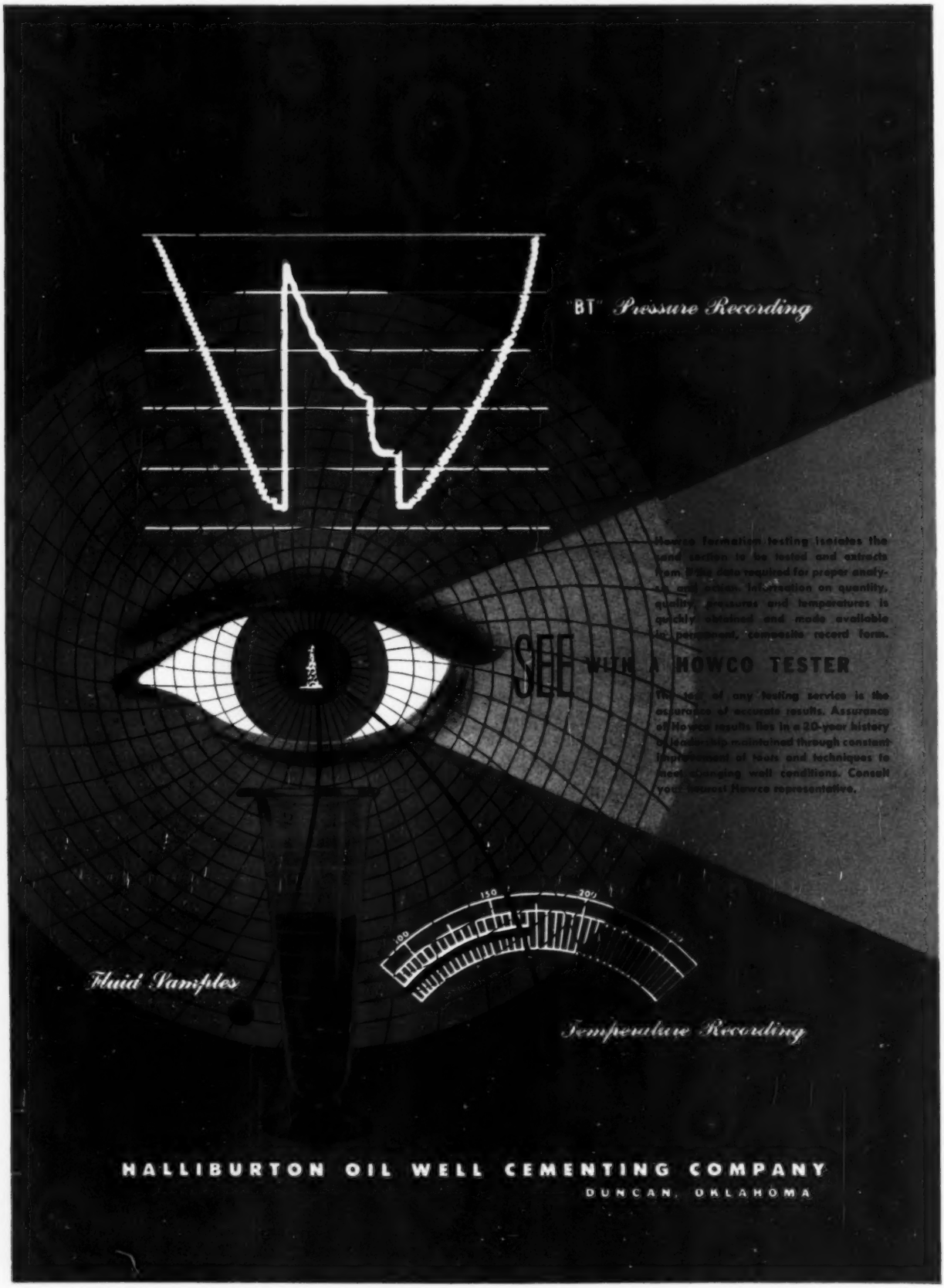
This Month's Cover

Portable rig drilling in the New Hope Southeast field near Lindsay, Oklahoma. Color plates courtesy "The Link," house magazine of the Carter Oil Co.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EDITORIAL

EXPORT MARKETS DESERVE MORE ATTENTION

ONE of the most significant, probably one of the most important, business developments of the past few months has been the return of competition. Reams have been written and millions of words uttered in arguments as to whether industry is entering upon a depression, a recession or merely readjustment to a more normal relationship between supply and demand. Meanwhile, industry has gone along adapting itself to conditions and demonstrating its vitality and resourcefulness. The salesman who, last year, was busy explaining why it would be impossible to fill orders until some indefinite time in the future, is now out trying to impress purchasers with the superior quality of the goods or services he has to offer. Instead of acting the suppliant, the buyer now exercises his traditional freedom of choice in selecting the goods or processes that most appeal to him. This is as it should be, for competition is the basis of the free enterprise system.

To take the oil business as an example: Experience of the past few months has belied forecasts of price disruption and predictions that exploratory work would be suspended and that drilling in the United States would fall away 50 percent during the year. Actually more new wells were drilled in the first four months of 1949 than in the corresponding period of the preceding year, more wildcats were completed and a proportionately larger number of productive oil wells brought in. With three million more cars on the highways, sales of motor fuel and oil are headed for a rise of seven to eight percent. Makers of oil heating equipment are certain of a 25 percent increase in installations. Diesel oil demand continues to mount, pipeline and refining capacity to grow.

Similarly the export market which has had to struggle against special difficulties is entering a new and important phase. When the ERP program was laid down, a large percentage of its projected expenditure was assigned to oil industry equipment. Due to difficulty in placing orders and assuring time of delivery, only a relatively small amount of business was done in the first year of ECA operations. The director of the petroleum section says that for the coming fiscal year the value of petroleum equipment to be included for the 16 ECA countries will be something over $100,000,000. The equipment expenditures of European countries are estimated at $200,000,000, half of them being independent of ECA participation and excluding $380,000,000 to be expended locally.

Other countries not included in the ERP program are finding ways of solving the financial problem involved in paying for equipment which they urgently need to increase the production, transportation and refining of their oil, and a new development of the overseas market for equipment appears definitely under way.

In any survey of business tendencies and sales requirements, however, it is obvious that important changes are pending. In the world today there unquestionably is a trend away from compartmentalized trade and toward a broader and freer exchange of commodities. With the United States adopting a policy of deliberately inviting greater imports, it follows that there must be a broad expansion of exports to maintain the national income at the level it has reached and on which the fiscal operations of the government are based. This is true of industry in general, and it applies particularly to the petroleum equipment industry, since it is recognized that, whatever may be the further growth of the domestic industry, a rising proportion of the world's total oil supply must be found outside the United States.

Some important truths relating to this subject were put before an export group in New York recently by John F. McKiernan, director of the regional office of the Department of Commerce in that city, who told his hearers that far greater efforts in product merchandising were needed to bring the volume of American exports up to a position commensurate with the nation's position in world affairs and with the expanding needs of its own economy. "We have a long way to go," he said, "before United States exports can serve their maximum usefulness, both as a means of aiding our own economy and assisting nations abroad in filling their requirements for American commodities."

Pointing out that there is still a disposition to concentrate top sales effort and talent on the domestic field and to treat export trade as a stepchild, Mr. McKiernan quoted statistics to show that American manufacturers appropriate only about half as much money to advertise and sell comparable quantities abroad as they do domestically, and he raised the question whether there is a proper balance between the nation's foreign investments, foreign sales and foreign publicity appropriations.

In this connection he told his listeners to expect increasingly vigorous competition from foreign manufacturers, saying, "The economic recovery of countries that are rehabilitating their industrial facilities will lead inevitably to more competitive conditions. Let us not underestimate the ability and persistence of our competition—the British, French, Dutch, Germans, Italians and others."

Christmas tree of flowing well in Steimbke field.

Well in the Hohenassel field.

GERMANY STRUGGLES FOR HIGHER OIL OUTPUT

By Alfred M. Stahmer

WHILE the refineries of northwestern Germany suffered more or less heavy bombing during the war, the oil fields remained practically undamaged. After the capitulation it was possible to resume production on a nearly normal level. But difficulties arose from lack of labor and material. Missing parts could not be replaced, and shortage of equipment caused continual delays. The extreme winter of 1946-47 with not enough coal for heating stopped drilling and production for months and marked the low point in Germany's postwar industry.

In 1947 a slow recovery began which received a decided impetus in June of last year when the currency reform was introduced. In the first half of 1948 a total of 178,724 feet was drilled in northwestern Germany; in the second half this was doubled to 340,314 feet by the same rigs. In Jan.-June before the reform 295,910 tons were produced; from July to December the output was 339,330 tons. It was possible also to step up the development of the new Emsland oil province discovered during the war. Pipeline construction, house building for laborers and road repair work were commenced. Emsland is the substantial hope of the German oil-producing industry. Possibly a supply sufficient for domestic needs may be obtained from the anticlinal fields in the western border area around the Ems river, which offer the promise of major deposits with better yields and lower production costs than in the heavily faulted and complicated salt dome fields of Hanover. However, it is the general opinion that the Hanoverian, Brunswick and Oldenburg areas present many additional chances for the discovery of new fields after the completion of detailed geophysical surveys

In Germany some 750 wildcats were sunk in the course of the last 15 years. In 1930 only four pools were producing, while today there are 28 fields, the prospective Emsland deposits among them. Up to now 5.3 million tons of crude were produced from the fields discovered since 1930, and a further 10 to 12 million tons of reserves from these pools are still available. Present plans contemplate a doubling of exploratory work during the current year.

From 42 wildcats completed in 1948, only one, Stemmerberg 4 of Gewerkschaft Elwerath, opened a new field, if the single hole with its yield of some barrels monthly can be called a field. From a geological point of view the discovery made on a foothill of the Weser mountain area, some miles southwest of Hanover town, is interesting. The oil, coming from 3,945 feet from a Cornbrash sandstone, is connected with a complicated overthrust structure, unique in the salt dome area around. Some three and a half miles east of the Emlichheim field in the immediate neighborhood of the Dutch border, the extension well, Ringe 1 (Wintershall, A.G.), initially pumped 70-80 barrels daily, but soon the hole went to salt water and was abandoned. It indicated that the oil-bearing area encountered is only a very small one on the deep flank of the Schoonebeek-Emlichheim structure with nearby edge water, so that no further wells are in prospect. The Emsland wildcat, Itterbeck 4, had oil shows between 1,804 and 1,844 feet in the Wealden (Cretaceous), but production tests proved to be without positive result. Drilling work on the Itterbeck structure will be continued. The same can be said about Hebelermeer 1 which found an oil impregnated Valendis sandstone on a structure in northern Emsland early this year. Of spe-

General view of Georgsdorf field (Emsland).

Rigging up Hardess 2 Wildcat.

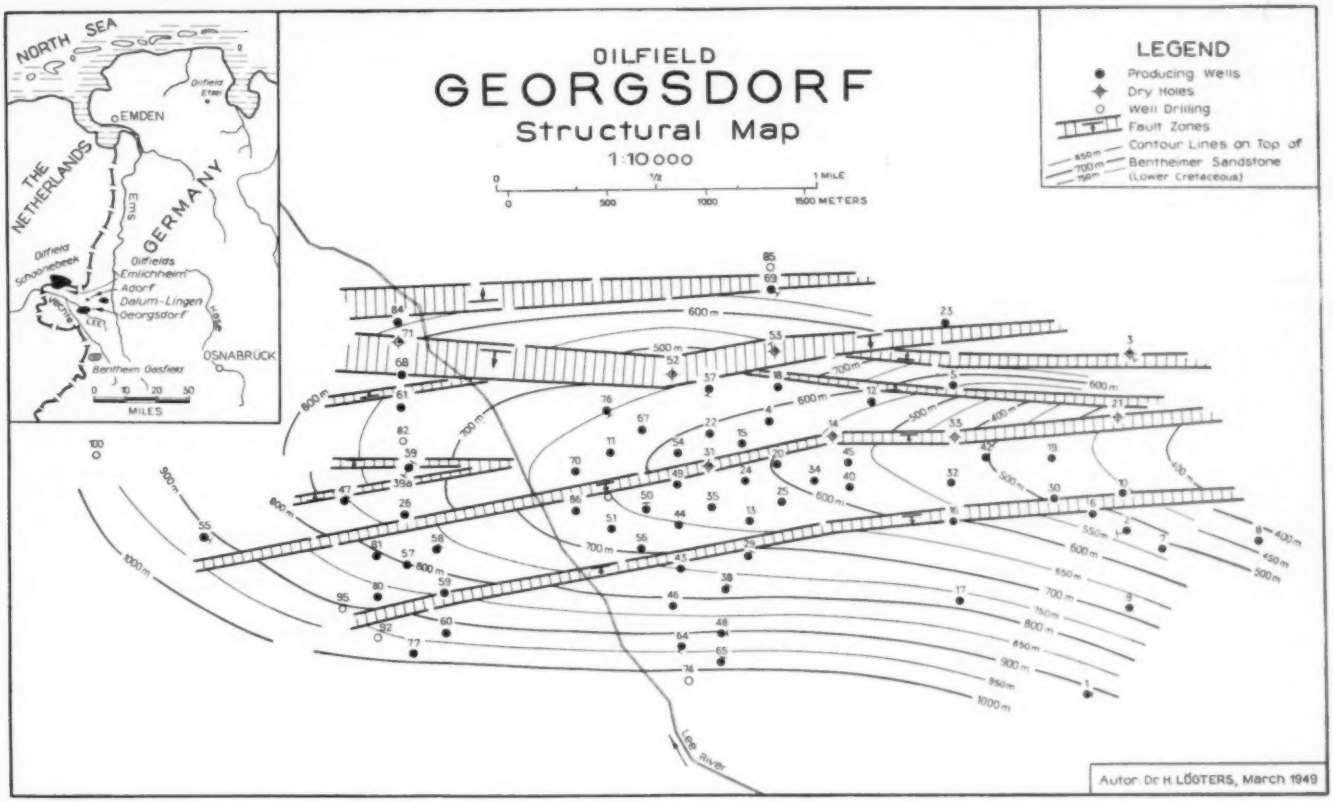
cial interest is the Carboniferous exploration now under way south of the Ems area in the Muensterland basin. Wildcat Ascheberg KM 1 near to an old gas well had a gas eruption from fissures in the Upper Cretaceous and Senonian but failed to give commercial production. Further drilling to test the Carboniferous is planned following seismic reflection surveys.

In Hanover oil shows were found in the wildcats of Hohenassel-Osterlinde 1 (Kimmerridge), Eitzendorf 4 (Valendis), Hardess 2 (Wealden), and Duingen 1 (Portland). In Schleswig-Holstein the well Hohenhorn 10 tested not more than 10 gallons of heavy oil with salt water in the Upper Cretaceous and was abandoned.

Table 1
Drilling In Northwestern Germany

	(In Feet) 1947	1948	Planned 1949
Exploratory wells	140,863	162,552	520,000
Extension wells	33,783	68,712	
Productive wells	170,449	287,846	503,750
Total	345,095	519,110	1,023,750

Of considerable significance are the results of field extensions recorded in 1948 and in the beginning of this year. The map shows the Georgsdorf field (Emsland), which is still third behind the well-known Nienhagen field in Hanover and Emlichheim, the German part of the Dutch Schoonebeek pool, situated on both sides of the international border. Georgsdorf probably will gain first place in the future, as Nienhagen is slowly declining and the extension of Emlichheim is fairly well determined, while the productive area of Georgsdorf is outlined only to the east where the Bentheimer sandstone becomes less porous. Two new Georgsdorf producers of importance are No. 55, the westernmost, which showed that the field extends at least half a mile



Input of explosives for seismic reflection shooting in the Hanover area.

further to the west. No. 55 met the oil horizon at a depth of 2,980 feet, while a more southerly hole indicated oil at 3,300 feet without traces of edge water. No. 84 in the northwest encountered a higher block behind one of the narrow east-west striking fault zones. The initial production of No. 84 was 50 cubic meters (315 barrels) daily, with high gas oil ratio from a depth of 2,130 feet. The reservoir pressure, which is thoroughly controlled in the field, shows no decline. It is assumed that 400-500 well locations are still available. The proved productive area comprises about 1,600 acres. The field operator in Georgsdorf is the Preussag, representing a joint partnership of C. Deilmann, Gewerkschaft Elwerath, Preussag and Wintershall. The neighboring fields of Georgsdorf, Emlichheim and Lingen were also extended in 1948, while the Adorf structure gave disappointing results.

In Hanover the Deutsche Vacuum Oel A.G. (affiliate of Socony-Vacuum) brought in some new wells in the Hademstorf field. Well Hansa 11 reached additional Wealden sands (Lower Cretaceous) on a new block and got an initial pumping rate of about 215 barrels daily. Two further wells had similar results. The output of Hademstorf increased about 75 percent in 1948. The Deutsche Erdoel A.G. got a second producer from the Raetic sandstone horizon (Briassic) in the Thoeren field with an initial yield of 75 to 110 barrels daily. Atop the Wesendorf structure, at the east flank of which a regular yield from the Lower Dogger sandstone has been obtained, a shallow extension hole flowed 30 to 35 barrels daily from a new Lower Cretaceous pay. A considerable widening of the Steimbke-Rodewald field was registered by the Gewerkschaft Brigitta (Shell-Standard Jersey) jointly with Vacuum. Progress can also be announced from the Deutsche Erdoel A.G.'s Heide field (Schleswig-Holstein), where recently a new field was discovered between Hemmingstedt and Heide, delivering heavy oil from the Zechstein. The Meldorf field was extended in a southwestern direction into the foreland of the North Sea dike.

An increase of production took place in the Fuhrberg-Hambuehren field where Itag successfully developed the Cornbrash production and in the Broistedt field, jointly owned by Preussag and Gewerkschaft Elwerath. On the other hand a decline of 70,000 barrels was reported from the Nienhagen-Haenigsen field.

Some of the numerous shallow holes drilled in the prospecting area had more or less promising oil shows. In the neighborhood of Celle town oil-impregnated Cretaceous sands were found in complicated tectonic situations. Recently a core hole on the west flank of the Schneflingen salt dome near the Russian zone border encountered an impregnated Dogger sand at a depth of 1,200 feet. Later deep drilling will show whether economic production is possible.

For the current year wildcatting in prospecting areas of northwestern Germany is foreseen, including Schleswig-Holstein, Hamburg basin, Hanover, Oldenburg, East Friesland, Emsland and Muensterland. Other wells in Bavaria were originally planned, but because the concessions applied for by some companies have not yet been granted, it is improbable that the wells can be started this year. The foreland of the Alps gained interest since the deposits of the Vienna basin were discovered and is now supposed to be a potential oil source for Germany.

In the area between the River Ems and the Dutch border in western Germany, a find was made during the latter part of April which may lead to development in the German border province. The wildcat Ruehlertwist No. 2 of Wintershall, A.G., northwest of Lingen some miles from the international border, has encountered the oil-impregnated Bentheimer sandstone, the oil horizon of the nearby fields, Emlichheim and Georgsdorf. Ruehlertwist is the prolongation of the Dutch geological structure of Coevoorden-Schoonebeek, which extends far to the east, crosses the Dutch border and emerges to a local high. While Schoonebeek, with a yearly production of about 3.5 million barrels yearly is a major deposit, the German oil companies hope for a good development of Ruehlertwist, which may be regarded as an extension of the prosperous Dutch field.

Particulars given by Wintershall are as follows: The wildcat Ruehlertwist No. 2 of Wintershall, A.G., located in Georgesdorf in which Gewerkschaft Elwerath, Preussag, C. Deilmann and Wintershall A.G. participate equally, has encountered the Bentheim sandstone, a very porous good oil-impregnated sand, at a depth of 2,255 feet, and this has been drilled to 2,285 feet. According to the core test and the Schlumberger diagram, it may be considered that this well opens a new field which may extend from Ruehlertwist easterly to the concession area of Dalum (jointly owned by Gewerkschaft Elwerath and Deutsche Schachtbau & Tiefbohr, A.G.). Casings are now being installed. After that, the Bentheimer sandstone will be entirely drilled and a production test will follow.

As Table 2 shows, German production was about 410,000 barrels higher in 1948 than in the previous year, mainly due to the upward trend in the Emsland, while the output of Hanover was maintained with the help of the new extensions mentioned. For 1949 a goal of 750,000 tons (5,250,000 barrels) of crude is anticipated.

Table 3 gives a picture of the participations in German production.

If the increasing efforts in western Germany to drill for oil result in the discovery of new fields, and the industry can be provided with more modern equipment, the overall costs of the yields might be reduced to such an extent that indigenous oil with its better transport situation can compete with foreign imports. Fields such as Nienhagen which has delivered 4.5 million tons of crude, and the new Emsland finds prove that the search for oil in the country is worth continuing from an international point of view.

Table 2
German Crude Oil Production
(In Barrels)

	1947	1948
Emsland		
Adorf	—	15,141
Emlichheim	363,972	453,950
Georgsdorf	169,190	371,672
Lingen	265,307	334,166
Total	798,469	1,174,929
Hanover		
Broistedt	20,034	28,441
Calberlah	2,765	3,129
Eddesse-Oelheim	18,501	16,450
Ehra	4,525	4,284
Eicklingen-Wienhausen	94,745	91,308
Etzel	29,204	31,031
Eilte	602	1,708
Fuhrberg-Hambuehren	297,059	334,208
Gifhorn	10,710	9,135
Hademstorf	39,788	65,919
Hohenassel	139,587	131,649
Moelme	34,503	33,131
Nienhagen-Haenigsen	941,521	870,821
Oberg	39,578	39,767
Steimbke-Rodewald	290,318	290,850
Stemmerberg	—	714
Thoeren	120,575	120,470
Wesendorf	312,102	356,202
Wietze	149,289	161,385
Total	2,545,410	2,590,602
Schleswig-Holstein-Hamburg		
Heide	392,798	354,921
Meckelfeld	13,580	14,847
Reitbrook	242,137	269,101
Total	648,515	638,869
Baden		
Forst-Weiher	29,729	27,720
Weingarten	14,196	14,560
Total	43,925	42,280
Overall Total	4,036,319	4,446,680

Table 3
Oil Production of German Companies
(In Barrels)

	1947	1948
German Private Companies: Gewerkschaft Elwerath, Wintershall AG, Deutsche Erdoel AG, C. Leibmann, Itag and others	2,691,556	2,925,580
Foreign Companies: Deutsche Vacuum Oel AG, (Socony-Vacuum) and Gewerkschaft Brigitta (Shell & Jersey Standard)	863,513	935,151
State Owned Companies: Preussag, Deutsche Schadtbau & Tiefbohr AG, and Braunschweigische Bohrgesellschaft	481,250	585,949
Total	4,036,319	4,446,680

COMPROMISE ON TIDELANDS BEING URGED

By Joseph Huttlinger

Washington

WHILE the question of state vs. federal control of tidelands exploration for oil has been relegated to the background recently, it is still a live issue and one on which a strong effort will be made to obtain Congressional action before the present session ends.

Some 50 members of the House and Senate have introduced bills dealing with the subject. The majority of these provide for quitclaiming federal title to such lands to the states. Political realists agree, however, that while such a proposal might get through Congress, it would hardly command sufficient support to overcome a Presidential veto, which almost certainly would be forthcoming.

As a result of this estimate of the situation, talk of a compromise measure has begun to make itself heard, although the diehards on both sides decry the possibility of any such agreement.

The leader in this movement appears to be Representative John E. Lyle, Texas Democrat; at least he is one member who has ventured to come out openly in proposing such an accommodation. In doing so he admits that he is taking his political life in his hands in view of the bitter feeling on this question in his home state, but he holds that it is the only course that will lead to an early settlement of the dispute which is urgently needed. He believes also that there is a good possibility of an agreement that will recognize for the most part the historic claims of the states to control of their offshore areas, while admitting a national interest in such areas when located in the open waters of gulf or ocean.

Writing to friends in Texas where the tidelands controversy promises to become a leading issue in next year's gubernatorial campaign, Mr. Lyle expressed his views in part as follows:

"I join with you in the firm belief that legally and historically Texas has the paramount right to title and control of this area. Consistently I have urged that right in Congress and, of course, will continue to do so. The discomfitting fact remains, however, that no legislation quitclaiming the federal government's proposed claim to these properties has become law.

"It does not appear, looking at the matter impersonally and practically, that such legislation can be passed during this session, and on the other hand we appear to be losing ground legally. I have in mind the California decision and the present petition of the federal government before the Supreme Court affecting Texas and Louisiana.

"I, therefore, propose that we resolve those differences by legislation. In this regard I would like to point out that no proposal made would compromise Texas' title to her 10½ nautical miles of tidelands."

While no bill embodying specific terms for a compromise between extreme views has been drafted, the general outlines suggested by the advocates of that form of settlement are along the following lines:

(1) The states would get ownership of the coastal areas out to a distance specified, which might vary in different areas. In Texas it would extend out 10½ nautical miles; in Louisiana it might be the same or more; in California and other states it might be less, perhaps three miles.

(2) The federal government would hold ownership beyond these distances.

(3) Revenues from leasing in the combined areas would be split 50-50 or in some other agreed ratio between the states and the federal government.

(4) A board, with membership named half by the federal government and half by the states, would issue leasing rights and have general overseer powers.

(5) State agencies, such as the Texas Railroad Commission, would handle proration, well-spacing and other matters on underwater regions off their coasts the same as on shore.

(6) All present leases would be validated.

While this is only a skeleton plan, it indicates the general course of thinking by the advocates of amicable settlement.

Like all compromises, the proposal fails to satisfy extremists on either side. Interior Secretary Krug believes Uncle Sam should be a sharper trader. Recalling his own vigorous words in defense of federal title to the areas in the past years, the Secretary is extremely loath to agree to any compromise. On the other hand, states righters in Texas and elsewhere take a dim view of the plan. Thus Governor Beauford Jester of Texas, Attorney General Price Daniel and Land Commissioner Bascom Giles have registered objections to receding a single step from the position they have taken.

Meanwhile the Supreme Court is still very much in the picture, having before it the action brought by the Attorney General to establish the federal claim to paramount rights over submerged lands off the shores of Texas and Louisiana. The only point on which the court has held hearings thus far is the question whether the federal government has the right to sue the states in order to get title. In this respect the May argument was merely a warm-up. Solicitor General Philip B. Perlman, taking the federal side, said yes; Texas and Louisiana, the only states specifically involved in the action, said no.

Louisiana argued that the whole precedent of high court actions is that a sovereign state cannot be sued without its consent. Texas agreed, adding that if legal action is to be taken, it should be in a lower court. Attorney General Price Daniel of Texas asked the high court to stay out of the matter until Congress acts "to clear up the dispute." He said a compromise plan is being worked out for speedy action.

This brought a retort from the government that Texas wants to lobby for state title to the lands. But, the peppery Texan asserted, so does the federal government.

Chief Justice Fred M. Vinson warned that the Supreme Court would act solely on the merits of the evidence laid before the eight justices; Associate Justice Robert Jackson disqualified himself from the case. The court will not be influenced by the doings of other branches of the government, said Mr. Vinson.

On the preliminary question of the federal government's right to sue the states without their prior consent, the Supreme Court on May 16 ruled in effect that such right exists by directing both sides to file their cases and answers before September 1 next. This means that the case will come directly before the high court, which can either conduct hearings in open sessions or appoint a special master to hear the evidence and report. It indicates a desire on the part of the top judicial authority to expedite the case, but since argument will be protracted, no final decision is likely before next year. If Congress really wants to handle the issue, it has the opportunity at its current session. In general the upholders of states' rights would prefer to have Congress act. The administration pins its hope on a Supreme Court decision.

In any event it seems clear that Congress must take some action sooner or later, whether it dodges the main issue or not and whether the ownership is to rest with the states or the federal government or both. If the federal government owns the lands, Congress probably will be called upon to set up the rules for leasing and the like. If the states own the lands, Congress very likely will have to establish regulations governing their exploitation.

EXPERIMENTAL SHALE REFINERY COMPLETED

By H. Boyd Morris* and D. L. Gilbertson**

Oil shale demonstration plant near Rifle, Colo. Shale processing equipment is at upper right. The refinery is located among the storage tanks near the center of the photograph. Buildings at the left house various plant auxiliaries and administrative offices. Photographs with this article are supplied by the U. S. Bureau of Mines.

LATEST step in the study of oil recovery from shale which is being conducted by the Bureau of Mines of the United States Department of Interior is the construction of an experimental refinery at Rifle, Colorado, which has just been completed. This is the first continuous unit for refining shale oil to be built in the United States. Construction was in charge of The Refinery Engineering Co., which contracted for the design, fabrication and erection of the refining and storage equipment. This work was carried out through the efforts of Bureau of Mines engineers and The Refinery Engineering Co.

On May 17, 1947, the Bureau of Mines dedicated the oil-shale demonstration plant at Rifle. At that time the vast efforts necessary to establish operational facilities in a remote mountainous region had been completed. Roads and utilities had been brought into the plant area and to the mine site. A 50-unit housing project had been completed and the necessary plant structures had been erected. Mining operations were well under way, and laboratory investigations of oil shale and shale oil had begun. Construction of retorting facilities, including a crushing-conveying-storage system and two batch-type N-T-U retorts, had just been completed.

During 1946 Bureau of Mines engineers had been compiling all available data on shale oil and making calculations to determine their requirements for a semi-commercial shale-oil refinery. That plant was to be the smallest that could be operated on a plant scale. Thus, operation of the plant would not only provide chemical and thermodynamic data but would also reveal operating characteristics of shale oil and furnish refining costs.

Early in 1947 The Refinery Engineering Co. was awarded a contract for the design, fabrication and erection of the refinery. The plant was to be designed in accordance with the specifications and data compiled by the Bureau of Mines engineers during 1946. The refinery was to be designed so that with only minor changes either atmospheric distillation, reforming, single coil recycle cracking or delayed coking could be performed with the same equipment. In addition to the thermal unit, facilities were to be furnished for treating and rerunning of distillates.

Refinery capacity rating was determined by the minimum practical size of tube still heater that could be designed to operate under the conditions of the various proposed operations. A flow rate of 300 BSD through the heater was established as the rated capacity. Thus, in delayed coking, 200 BSD of raw shale oil could be charged to the unit and permit 100 BSD of recycle. In the case of recycle cracking of the refractory charge stock, the plant capacity is rated at 50 BSD charge with 250 BSD recycle. The delayed coking scheme of operation established the design capacities for most items of equipment. The more severe operating conditions encountered in recycle cracking and reforming, however, determined the mechanical design specifications.

It was decided that an adaptation of the single-

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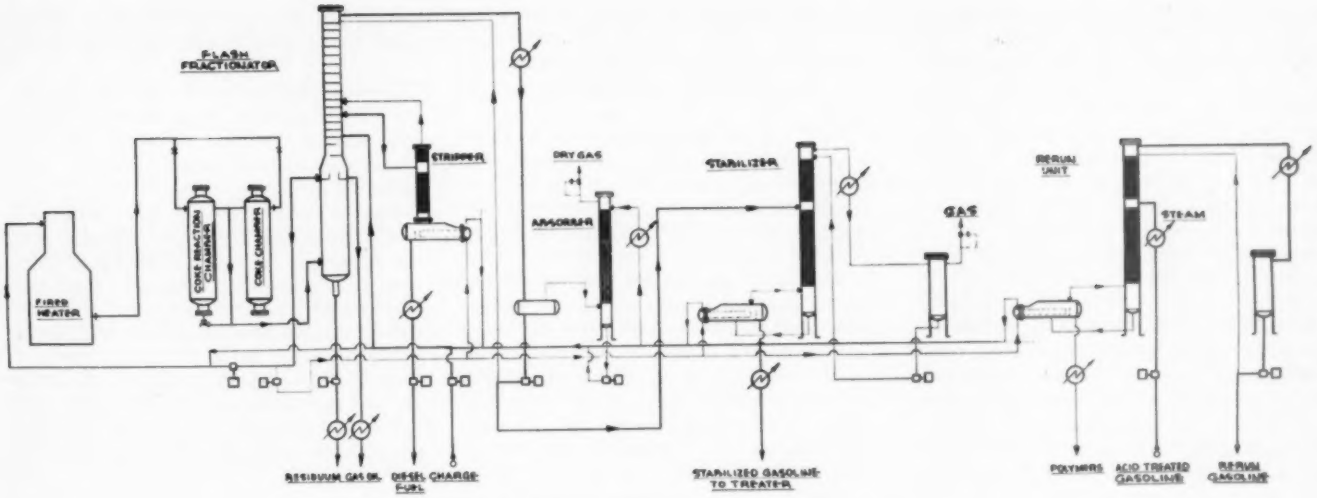
** Process Engineer, The Refinery Engineering Co.



Flow diagram of experimental shale oil refinery of U. S. Bureau of Mines.

coil Dubbs process would be the most satisfactory unit for the conversion and recovery of shale oil on an experimental semi-commercial basis. The basic processing operation is illustrated in the schematic flow sheet.

The "cell-type upshot" heater employed contains a most favorable combination of flexibility, control of heat distribution and simplicity of maintenance. The tubes are 1¼-inch by ⅞-inch by 12 feet, two percent chrome, ½ percent moly, with 2¼ percent chrome, one percent moly fittings. The tubes and headers are rated for 1,000 psi at 1,050°F service. Cracked shale-oil residuum is used as burner fuel.

Flexibility, the all-important requirement of an experimental heater, is achieved by a scheme of external conversion piping. The convection bank of tubes is divided into three separate continuous coils, the terminals of each coil projecting through the sidewalls of the header compartments. A set of simple cross-over piping details permits the use of any one of three different flow schemes through the heater. By this design the three convection coils and the radiant coil may be connected in a sequence that will give the heating curve desired for any one of the operations.

Either one or two four-foot soaking chambers are provided for service in recycle cracking and delayed coking operation respectively. One of these vessels is suitable for 330 psi pressure at design temperature and is equipped for use as a reaction chamber in cracking operation or as a coke drum when coking. The other vessel has a design pressure of 125 psi and is suitable for only the coking operation. The capacity of the chambers was determined on the basis of a 48-hour cycle, allowing 24 hours for cooling and decoking. Because of the small size of these chambers, winch and cable decoking equipment was provided rather than the more modern hydraulic equipment.

The fractionation section of the cracking plant consists of a combined flash fractionating column, a side-cut stripper and an absorber and stabilizer. The flash fractionator is a 30-inch by 37-foot fractionating column mounted on a 42-inch by 20-foot flash chamber. The fractionating column contains 16 bubble decks and two side-to-side pans.

Stripping of light ends from the side-cut diesel fraction is achieved by reboiling rather than by the use of steam. The equipment consists of a 10-inch ID by 6¾ foot column counted on a kettle type reboiler. The stripping column is packed with ⅝-inch ceramic raschig rings.

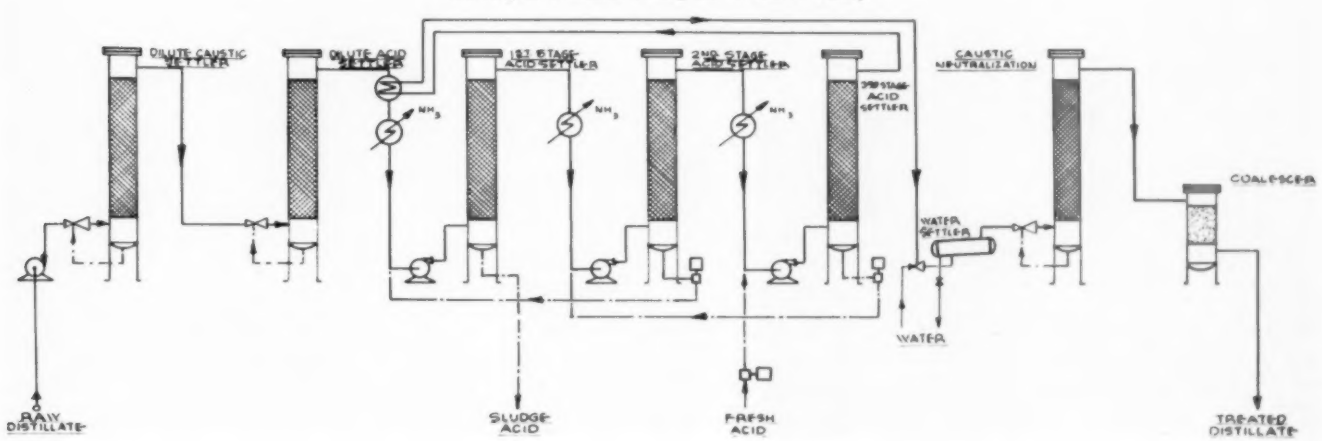
An eight-inch OD by 20-foot packed absorption column is provided for the recovery of light ends from the fractionator receiver gas. The stabilizer is a 16-inch OD by 24-foot packed column. Stripping heat is provided by a conventional kettle-type reboiler.

The rerun unit consists of a 16-inch OD by 14-foot packed fractionator with a reboiler, feed preheater and the usual fractionating auxiliaries, including the overhead condenser, receiver and reflux pump.

Instrumentation of the plant is very complete. Temperature, pressure, flow and liquid-level instruments provide for precise control of the plant and accurate measurement of heat and material balance of all units.

Minimum corrosion protection has been provided for initial operation, so that the corrosion

Flow diagram of chemical treating unit for shale oil refinery.



characteristics of the oil processed may be observed and measured. Pumps, exchangers and control valves were all specified in accordance with usual practice for high-sulfur crudes. None of the vessels was lined, but provision was made for adding a ganister lining in the coke drums and flash chamber at a later date. The fractionator trays are 410 stainless; and 4-6 percent chrome, ½ percent moly was selected for the transfer line and heater cross-over connections to provide information on the suitability of other materials for this type of plant.

The basic flow scheme for cracking and coking operations provides for charging raw oil either directly to the heater coil or to the lower section of the fractionating column, depending upon the type of charge stock and the particular operation. When coking residual charge stock, this material would be charged directly to the heater along with the desired amount of heavy gas oil from the bottom of the fractionating section. In recycle cracking of gas oil, either all or part of the charge would go to the lower section of the fractionator for heat exchange and then would be charged to the heater with a hot-oil pump. The necessary quantities of gas oil from the bottom of the fractionator would be withdrawn for reboiler heat and absorption oil and, in coking operation, any quantity in excess of that recycled would be withdrawn as product.

In recycle cracking the mixture of vapor and liquid from the heater enters the coke-reaction chamber, which has been designed for 330 psi at 950°F and provides additional time for soaking or reaction. The total mixture is withdrawn from the bottom of the reaction chamber through a pressure-reducing valve and introduced to the base of the flash chamber for product separation.

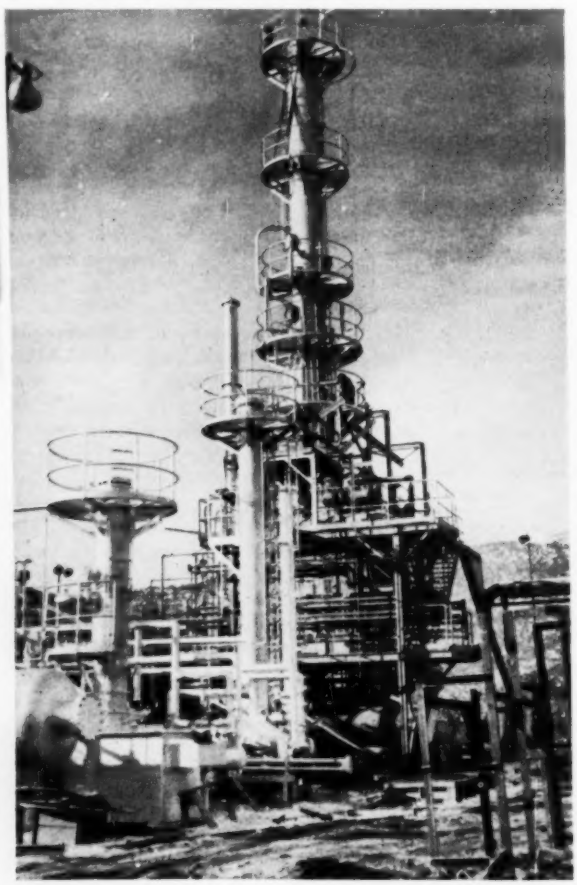
In the coking operation the coke drums are operated at a lower pressure to permit the vaporization of all but the very high boiling hydrocarbons. The effect of time and temperatures reduces the liquid residue in the coke drums to vapor and solid coke. Only the vapors are fed to the flash chamber for further processing. As mentioned previously, the coke chambers are operated in cycles: while one drum is operating, the other is cooled, decoked and prepared for operation.

The other operations for which this unit was designed, atmospheric distillation and reforming, are both "once-through" processes and are simply provided for with bypasses. The charge stock is pumped directly to the heater, and the hot mixture from the heater is transferred directly to the flash chamber, thus eliminating the reaction chambers. The basic differences between reforming and topping operations are the charge stocks and the operating conditions in the heater.

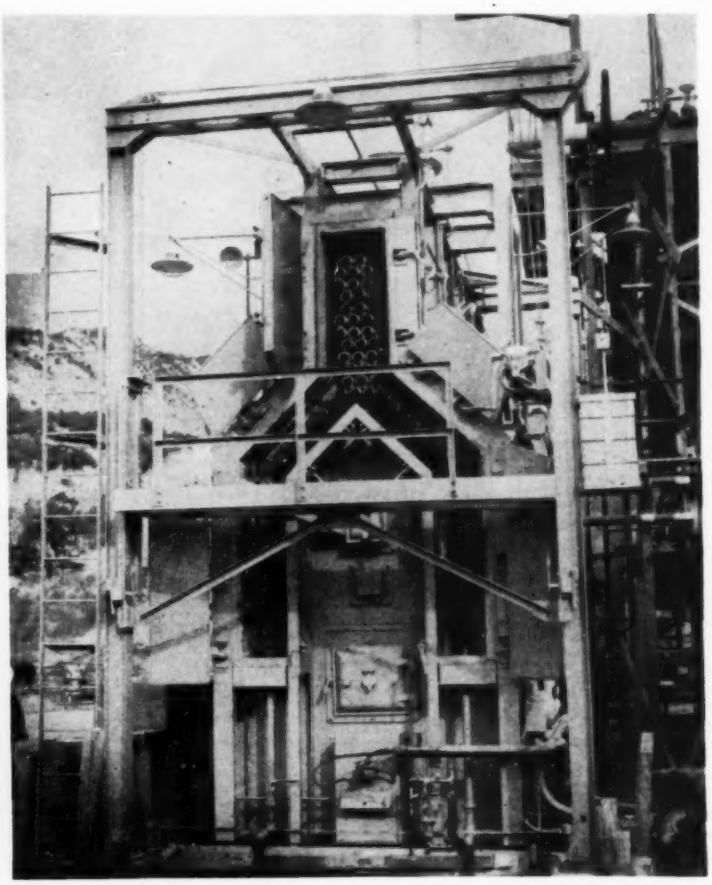
The fractionation section of this unit is conventional for all operations in both function and design. Gasoline, diesel fuel, gas oil and heavy fuel oil are separated in the flash fractionator. The heavy fuel oil and the gas oil are simply cooled and sent to storage. The diesel fuel is withdrawn as a liquid, stripped of its light components and sent to storage. The gasoline fraction is taken overhead as a vapor and condensed. Gases not condensed are introduced at the base of the absorber. Condensible hydrocarbons are recovered by the absorption oil and returned to the fractionator. The condensed gasoline is pumped to the stabilizer where separation of excessive quantities of butanes and lighter is effected. The stabilized gasoline is then sent to the treating plant.

The chemical treating of the distillates begins with a dilute caustic wash for the removal of hydrogen sulfide and light mercaptans, followed by a dilute sulfuric acid wash for the removal of nitrogenous compounds. The distillate, having been thus freed of its chemical active components, is then subjected to three stages of countercurrent extraction with concentrated sulfuric acid at reduced temperature for sulfur removal and improvement of color and oxidation stability. The

Shale oil refinery vessels: The tallest tower is the flash fractionator. Others, left to right, are the absorber stabilizer, and rerun column for redistillation of acid treated gasoline. One end of the horizontal gas balance tank is shown at the left.



Heater with header doors opened to show tube arrangement. External tube cross-overs are located at the other end of the heater.



distillate is then water-washed and neutralized with a final dilute caustic treatment. Following chemical treatment, the distillate is redistilled to remove the polymers formed in acid treating, and the specification end-point distillate returned to the treating plant for "doctor" finishing.

The treating plant is a series of mixers and separators designed for the continuous flow of distillate and reagent. The basic flow scheme is illustrated in Figure 2.

Each interstage pump serves as a mixer as well as a means of transferring fluids. The contacting of distillate with caustic, dilute acid and water is achieved by jet pumps. The mixing of the distillate wtih concentrated sulfuric acid is effected in centrifugal pumps. Mixing and circulation of reagent by the jet pumps is achieved by a pressure drop in the distillate stream across the eductor. This pressure drop is recovered by the centrifugal pumps as they effect the contact of the distillate with sulfuric acid. Small positive displacement pumps are used to transfer the sulfuric acid from stage to stage. All vessels, with the exception of the water settler, are vertical. Each vertical settler is packed with ½-inch raschig rings to facilitate separation of entrained droplets of reagent.

Acid treating is conducted at a low temperature to reduce losses due to polymerization and sulfonation. Temperature reduction is achieved by heat exchange with liquefied ammonia in chillers provided for each stage of acid contact. The ammonia vapors from the chillers are returned to a refrigeration system where they are again liquefied by compression and water cooling.

Carbon steel is used throughout the treating unit with the exception of equipment in contact with the dilute acid and ammonia. The dilute acid and water settlers are lead-lined. Hastelloy B eductors and plastic-lined pipe serve these vessels. The ammonia piping system employs carbon steel pipe with cast iron fittings.

An induced-draft cooling tower and four vertical spray coils were installed as a part of a closed cooling-water system. The design capacity of this installation permits cooling 300 GPM of treated water as it returns from the cracking unit heat exchangers at 120°F to 85°F. Raw water is circulated over the tower and coils as the cooling medium.

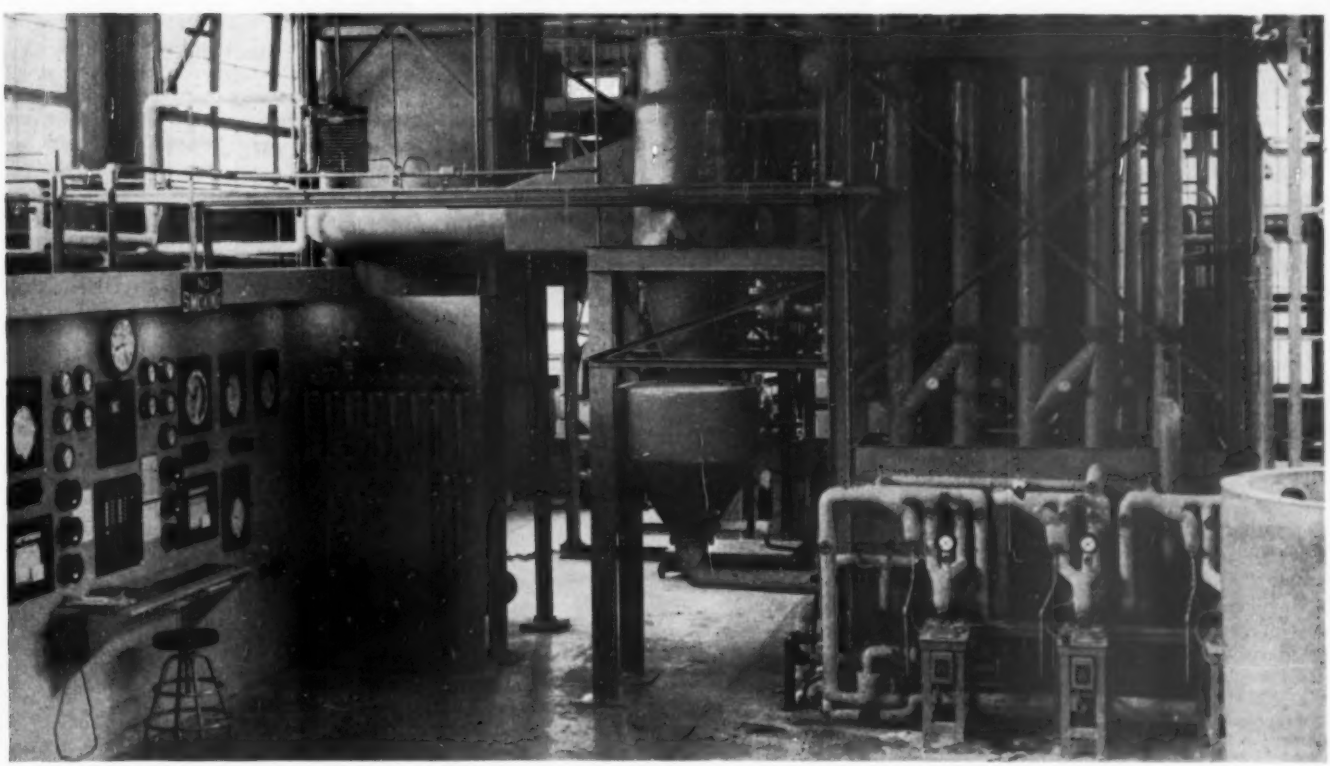
Saturated steam at 175-pound is brought to the refinery from a central boiler plant which also serves the retorting unit, laboratory and pilot plant. The exhaust steam at 40-pounds is used for tank, building and feed water heating. All condensate from the refinery is returned to the boiler plants.

A refinery storage system of 23,000 barrels total capacity has been installed. Eight cone-roof welded tanks, with a total capacity of 16,000 barrels, serve as product storage for the retorts and as charge tanks to the refinery. Charge and product storage for the treating unit and run-down tankage for the thermal unit was provided by 23 welded tanks with a combined capacity of 2,700 barrels. Finished product storage consists of six all-welded cone-roof tanks with a total capacity of 4,500 barrels. A pumping system was installed for the transfer of stored products, blending and truck loading.

Safety features were given first consideration in designing this plant. Blind flanges and interchangeable piping details instead of manifolds were used in the bypasses for the different operations. All relief valves are connected into a main blow-down line, which terminates at a sump condenser and flare stack at the extreme edge of the plant site. A fire system was installed with water hydrants and foam chambers at strategic points throughout the refinery and tank farm.

This installation completes the initial refining construction program at the Bureau of Mines oil-shale demonstration plant. Data obtained from the operation of the refinery will be of substantial aid in answering some of the technologic problems of shale-oil refining and should point the way to improved processes, which may result in the adaptation by modification of present petroleum processes or in the development of entirely new methods. The operation of this refinery will put the ultimate goal, the production of fuels from shale oil, at economic levels, a step nearer.

Pilot plant gas-flow retort for continuous extraction of oil from shale at Rifle. The retorting chamber is the large rectangular vessel to the left of the instrument panel. Crushed shale comes through the roof of the building into the preheater and flows down through the retorting chamber. Hot gases passing across the moving shale bed carry the oil vapors through a cyclone dust separator to the condensing system at right.



INTERNATIONAL STANDARDIZATION PROGRESS

A Review of the Contributions of the Institute of Petroleum in the Development of International Standards of Weights and Measures

By H. Hyams, F. Inst. Pet.*

IT is not surprising that a modern industry such as that concerned with petroleum production and distribution on a worldwide basis should have devoted considerable attention to the subject of Standardization. It is obvious that standards and specifications for the enormous range of equipment and materials used in the industry help to smooth operations as well as effect economies. Standard methods of testing petroleum products are equally essential if the results of quality testing are to have any real significance or value. Similarly, if quantitative measurements of the vast quantity of gaseous, liquid and solid petroleum products which exchange hands each year are to win the ready acceptance of the parties concerned, the methods by which such measurements are taken must be standardized and agreed.

It is fair to ask what is the purpose underlying the efforts which have been made during the past 15 years by the Institute of Petroleum working in close conjunction with the American Society for Testing Materials, to secure uniformity of measurement procedure and improvement in measurement accuracy.

The answer can be summarized under three heads:

(a) Sources of dispute in national or domestic transactions as between buyer and seller, and in international commerce, can and will surely be eliminated. If, for example, a country measures the oil it buys on the metric system, the methods used in that country for computing receipts should yield identical results with those obtained by the shippers were they to measure in American or British units.

(b) The purchaser of petroleum products is entitled to receive correct measurement in his purchases, within the limits of accuracy of commercial measurement. Similarly, the vendor wants to be reasonably certain that he neither over-delivers nor under-delivers in his sales.

(c) As explained later accurate measurement assists in loss control. It is only by balancing the cash value of real losses against the cost of installing improved equipment which is known to reduce losses, that one can calculate whether the capital cost involved can be justified.

In all their work and studies, those connected with oil measurement standardization have had to face up to the issue of competitive national standards of weights and measures and varying trade practices and have had to devote their energies towards a co-ordination of these systems in order to facilitiate and promote international trade in petroleum.

The problems which have been encountered may be divided into two classes, those of a national or domestic character, and those of an international nature. In general, the former are usually fairly easily resolved but it is when questions on an international scale have to be considered that real difficulties are met. We are still far from an international system of weights and measures and in many cases long established trade practice has influenced the adoption of a particular standardized procedure. For example, while the American and British oil industries prefer to refer their volumetric quantities to a standard temperature of 60°F, most European countries have chosen 15°C (59°F) although there are some, for example Sweden, who stipulate 20°C (68°F), presumably because this latter temperature was favored for international adoption by some sections of the pre-war International Standards Association. South Africa has laid down 62°F presumably because this temperature is involved in the statutory definition of the Imperial gallon. Similarly, the choice of instruments has in some cases been based on those already in use in older industries, for example, the API hydrometer based on the older Baumé scale.

Other factors which have had to be considered are types of instruments and the conditions under which they are used, tables of volume and gravity correction factors, tables of volume/weight conversion factors, and particularly the interpretation of results and the degree of accuracy obtainable or desirable. In laying down standard procedures rapidity in measurement has had to be taken into account since accurate but necessarily complicated procedure may involve delay to shipping.

As regards the degree of accuracy, the opinion is now widely held that an accuracy of 0.1% can be achieved in routine measurements if the methods now standardized are used. This degree of accuracy should be bettered for loss control work. The cost however, of applying very accurate methods increases very considerably as the tolerances are reduced and a stage is soon reached when any improvement in accuracy is no longer economical.

Three main systems of oil measurement are in use throughout the world, the Imperial or British system, the American system, and the metric, system, although considerable differences exist between areas using nominally the same system. Such differences are usually due to local fiscal requirements. In the United States bulk quantities of liquid petroleum products are to a very considerable extent measured and invoiced on the basis of barrels at 60°F. In countries using the Imperial or metric systems of measurement, however, it is quite usual to find that bulk quantities of some products, particularly fuel oils for bunkers, are invoiced in long tons or metric tons whereas other products are measured and invoiced on a volume basis.

When oil is shipped from one area to another using a different system, reconciliation of quantities supplied with quantities received can only be effected if the fundamental differences between the two systems are fully appreciated and if the correct constants and conversion factors are employed. The need for some measure of international standardization is thus apparent if disputes over quantities are to be avoided, such standardization providing both parties to a transaction with recognized measurement methods and apparatus which are applicable to any of the systems of measurement.

The need for international standardization has long been recognized in the United Kingdom, particularly perhaps in view of this country's position as the world's largest importer of petroleum products from a variety of producing areas. As far as the United States was concerned in the past, such need was not so apparent but in recent years their increased participation in foreign production, particularly in the Middle East, the numerous exchange agreements in force with foreign oil interests, and factors associated with deliveries under ERP, have all made the matter of pressing importance. On the other hand, however, domestic standardization in oil measurement procedure received in earlier days more attention in the United States than in the United Kingdom. The work of the U. S. Bureau of Standards on thermal properties of petroleum and the first publishing by that body of the National Standard Petroleum Oil Tables as far back as 1916, and the standardization of the API hydrometer in 1921 may be quoted as examples.

Although a standardization committee was formed in 1921 by the Institute of Petroleum, which in standardization matters, bears a similar relationship to the British Standards Institution as does ASTM committee D.2 to the American Standards Association, it was not until 1931 that a special Sub-committee No. 10 was formed to consider all aspects of oil measurement standardization.

In his presidential address to the Institute of Petroleum in 1932[1] James Kewley drew atten-

* Shell Petroleum Co., Ltd., London. Chairman, Institute of Petroleum Standardization Sub Committee No. 1 Measurement and Sampling.

tion to the existence of many out-of-date factors in use for the interconversion of weights and measures from one system to another, resulting in much confusion in oil accounting. Under his chairmanship, the Oil Measurement Sub-committee No. 10 studied this question and in the same year published "Measurement of Oil in Bulk Part I—Standard Weights and Measures"[2]. This publication which was produced in close co-operation with the standards department of the British Board of Trade and in the preparation of which contacts were made with the United States Bureau of Standards and the International Bureau of Weights and Measures in Paris, contains authoritative factors for interconverting weights and measures in the Imperial, United States and metric systems. It also contains much useful information on the history of the various systems of weights and measures. These factors subsequently received the blessing of the API and have since obtained almost worldwide recognition.

By 1933 the question of weight versus volume systems of measurement had become a subject of acute discussion in Great Britain. In consequence, Sub-committee 10 considered that a useful purpose would be served if the matter were investigated. There are many arguments for and against measurement by weight, and it is worth noting at this point the principal claims of the advocates of the two systems. Those who support measurement by weight claim that weight is constant and independent of temperature, that freights are by long established custom calculated on a weight basis, that weights of bulk cargoes of petroleum products must be determined in order that loading draughts may not be exceeded, and that it is usual to work out comparative boiler efficiencies on a weight basis. Furthermore, they argue that the correction of volume determinations to a standard temperature requires the use of accurate coefficients of expansion, a very decided complication with present day products. The supporters of measurement by volume, on the other hand, claim that the calculation of weights of large quantities of liquid petroleum normally necessitates the determination of the volume anyway and that the subsequent conversion of this volume to weight will introduce an avoidable error into the final result since the specific gravity must be determined with considerable precision if any high degree of accuracy is to be achieved.

Tentative recommendations that measurement should be standardized on a volume basis were put forward in a paper[3] on measurement by volume sponsored by the Sub-committee and presented at the first World Petroleum Congress in London in 1933. These recommendations were, in effect, accepted by the congress delegates and it was tacitly left to the Institute of Petroleum to pursue the matter further.

The Institute of Petroleum decided that before putting the matter forward to other standardizing bodies a useful purpose would be served if users of fuel oil were invited to express their views fully on this subject. A circular letter was accordingly addressed to 22 large shipping companies in Great Britain and abroad, the main line railway companies and government departments. Of 15 representative replies received, six were in favor of standardization of measurement by volume, five were in favor of measurement by weight, three expressed no decided opinion and one considered it unimportant whether weight or volume was adopted.

This divergence of opinion showed that further ventilation of the subject was needed. A paper[4] considerably amplifying the one presented at the congress was read before the summer meeting of the Institute of Petroleum in 1934, and aroused considerable discussion. It was resolved at that meeting that the institute should be requested to have the question of standardization of measurement on a volume basis brought to the attention of national standardizing bodies with a view to ultimate international agreement.

Before taking steps to implement the decision referred to above the Institute felt that it was necessary to collect further data on thermal expansion of petroleum products. Work on this subject, was therefore, undertaken by Sub-committee 10 but was not completed until 1941 at which time the question of weight versus volume could not of course be pursued further. It would appear, however, that sooner or later the matter will have to be raised again.

The report on thermal expansion published in 1941[5] contains information on 179 different petroleum products. These data covered materials ranging from aviation spirits to asphalts, collected from a wide variety of sources throughout the world and including products derived from cracking, solvent extraction processes, etc. The data contained in this document corroborated the wide applicability of the tables in Circular C410 of the U. S. Bureau of Standards, which had already been largely adopted by British operators since no comparable tables then existed in the United Kingdom. The further conclusion at which the committee arrived was that the technical advantages of producing entirely new tables would be more than offset by the commercial disadvantages of the existence of small discrepancies between the two sets of tables. Where very accurate figures are required in special cases, the report concluded that the particular coefficients of expansion which were included in the document could of course be used for those products which differ from those upon which Circular C410 was based.

In 1941 Sub-committee No. 10 was reformed on a much wider basis and became IP Standardization Sub-committee No. 1. The detailed work of this Sub-committee has been divided among eight panels, each dealing with one particular aspect of oil measurement. The terms of reference and the scope of the work of the Sub-committee and its panels fall into two main divisions:

(a) The preparation, revision and keeping up-to-date of certain methods of test which appear in the annual volume of IP Standard Methods of Test, i.e., Specific Gravity determination and Sampling of Petroleum Products.

H. Hyams

H. Hyams, author of the accompanying article, is a vice president and member of council of the Institute of Petroleum; also chairman of I. P. Finance and By Laws committees; member of Election, Standardization, House, Publications and Public Relations committees. He has been chairman of I. P. Standardization Sub Committee No. 1 on Oil Measurement and Sampling since 1940, and in this capacity he inspired the Institute's publications, "Measurement of Oil in Bulk, Part 1—Standard Weights and Measures" (1932) and "Tables for Measurement of Oil" (1945).

Mr. Hyams has been attached to the London technical department of Shell Petroleum Co. Ltd. since 1919. For many years he has enjoyed senior responsibilities relating to such matters as oil measurement and loss control; petroleum standardization; collection, recording and dissemination of technical information; laboratories and laboratory equipment; office management. In connection with his work, he has visited most European countries, and in 1945-1946 he made a tour of the United States and Venezuela.

He is author of such Shell Group publications as "The Sampling and Measurement of Petroleum Cargoes" and "Oil Measurement Tables". He is joint author of "Sea Transport and Measurement of Petroleum Products."

L. C. Burroughs

L. C. Burroughs of Shell Oil Co., Inc., is chairman of Subcommittee 15, Measurement and Sampling, ASTM Committee D-2. He is directing the work in the United States on international standardization. Mr. Burroughs is chairman also of the API Committee on Disposal of Refinery Wastes. He has been a member of the Shell organization since 1925, serving as chief chemist, chief technologist and assistant superintendent at various refineries. He came to company headquarters at New York to take up his present position as assistant to the vice president for manufacturing.

(b) The study of all processes and equipment which are concerned with the measurement and sampling of petroleum and allied products, this with a view to preparing recommended standardized procedure and/or instructions, and the publishing of recommendations in respect of associated apparatus and equipment.

It was natural that the work of the Sub-committee was somewhat curtailed during the war years, but nevertheless much preliminary work was done. Since the war there has been a great deal of activity and all aspects of oil measurement have indeed been covered. Three publications have appeared in the name of Sub-committee 1; "Tables for Measurement of Oil"[6] and "Measurement of Oil Depths"[7] in 1945 and "Tank Calibration"[8] in 1948.

Perhaps the most important of the above publications and one filling a long-felt want in the petroleum industry in the British Commonwealth, is the book of tables which includes not only tables for the calculation of weights from volumes and vice versa, entered against specific gravity 60°F/60°F, but also tables of volume and specific gravity correction factors based upon, and in line with, Circular C410 but extended and with argument specific gravity 60°F/60°F instead of degrees API.

"Measurement of Oil Depths" has the status of a standard method and "Tank Calibration," which covers vertical cylindrical tanks only, a tentative standard. Publications on temperature measurement, calibration of horizontal cylindrical tanks and revised methods for sampling and specific gravity determination are in an advanced state and will be published shortly.

In the preparation of the publications on recommended standard procedure IP Sub-committee 1 has recognized that in general three standards of accuracy are required in oil measurement, viz:

(a) A simple but reasonably accurate method suitable for internal operations in refineries, marketing installations, etc.
(b) A more accurate method for evaluating quantities of oil purchased and sold and for fulfilling contractual obligations.
(c) A very accurate method for loss control or referee work.

The methods have been drawn up to satisfy fully the requirements of (b) and where necessary, alternative more elaborate procedures have been given in order that the requirements of (c) can also be met. The various methods which have been published individually will later be collected into one comprehensive manual of oil measurement procedure. This manual will probably be written in a form suitable for the guidance of supervisory staff, not necessarily as a field manual for gaugers. It is the view of many in the United Kingdom that the preparation of a field manual is best left to individual oil companies in order that they can suit their own particular needs.

The Institute of Petroleum Sub-committee has always maintained a close liaison with its American counterpart — Sub-committee XV of the American Society for Testing Materials Committee D-2., and many personal contacts have been made.

The first fruits of this liaison was the acceptance by the American Society for Testing Materials, with only minor modifications, of a document[9] drafted by Sub-committee 1 on "Principles Governing Oil Measurement Procedure." This document was simultaneously published by the American Society for Testing Materials and the Institute of Petroleum in 1945, respectively in "Standards on Petroleum Products and Lubricants" and "Standard Methods for Testing Petroleum and its Products."

There has since been a full exchange of ideas and information and the publications on oil measurement by both bodies have been submitted by the one body to the other in all stages of drafting.

When the writer visited the United States in 1945/1946, he took the opportunity of furthering the cooperative work by having detailed discussions on outstanding oil measurement standardization problems with L. C. Burroughs and his colleagues in the ASTM. The Institute of Petroleum was then honored in May 1948 by a visit to this country by L. C. Burroughs and J. G. Detwiler, members of Committee D.2 and chairman and member respectively of Sub-committee XV. During a very busy six weeks, these two delegates attended meetings of the Institute of Petroleum Sub-committee 1 and all its panels. A great deal of very useful ground was covered and it was soon apparent that apart from comparatively minor details of procedure both bodies were in complete agreement on principles.

The most important outcome of the more recent visit referred to above was the decision reached to recommend the joint publication by the American Society for Testing Materials and the Institute of Petroleum of a comprehensive book of oil measurement tables. This recommendation has since been fully approved by both bodies. A list of some 37 tables, embracing not only the Imperial and United States systems of measurement but also the metric has been agreed. To ascertain the needs of those based on the metric system of measurement the ASTM delegates and representatives from the Institute of Petroleum had discussions on the European continent with representatives from the cognate standardization bodies in France, Belgium and Holland. These discussions also showed much unanimity of views. Among other things it was agreed that the standard reference temperature of 15°C should be recommended for adoption in metric areas and that the proposed Institute of Petroleum/American Society for Testing Materials metric tables should give metric weights in air. It is now hoped that when the book is published metric areas will adopt these tables and thus bring metric weights into line with the Imperial and the United States systems. It is not as widely known as it should be that whereas trade custom in the United States and the British Commonwealth requires that weights of liquid petroleum products shall be weights in air, the methods and apparatus adopted in nearly all countries using the metric system result in weights in vacuo. Much confusion has resulted from this, which it is hoped, will be resolved as a result of the joint efforts by the ASTM and IP.

The work in connection with the preparation of the book of tables is being divided between the Institute of Petroleum and American Society for Testing Materials Panels and it is very much hoped that in the course of the next year or 18 months it will be simultaneously published by the American Society for Testing Materials and the Institute of Petroleum. When it does appear it will supersede and replace Circular C410 and the present Institute of Petroleum book of tables.

Standardization, besides providing referee methods for measuring quantities of oil purchased and sold or for assessing royalties, taxation, etc., will assist individual oil companies with loss control. Losses of oil, which are of course equivalent to losses of cash, are becoming more serious with increasing production, refining and handling costs, freights, royalties, taxes, etc. Adequate control is, therefore, essential. This cannot be achieved if bad measurement methods are used and unnecessary errors are allowed, in consequence, to appear in measurements, since these will tend to cover up real physical losses.

Errors in measurement fall into two main categories, fortuitous and systematic errors. Fortuitous errors include absolute mistakes but consist mainly of small errors in observation. No method can exclude mistakes, but good standard methods can do much to reduce their incidence. Errors in observation tend to cancel out in a long series of measurements and higher limits may be tolerated than for systematic errors. Any standard method should, therefore, state the limiting conditions of, say, oil temperature, specific gravity, etc., under which it is applicable, since these are factors limiting error. For example, if by the use of a certain standard method, it is possible to determine the temperature of the contents of a storage tank within 2°F of the true mean temperature, the resultant error in volume calculated at a standard or other temperature, will not be greater than approximately plus or minus one part in 850 in the case of a gasoline. If, therefore, an accuracy of not less than one part in 1000 is required, it will be necessary to use a method by which it is possible to determine the average temperature of the gasoline within 1°F. Systematic errors which usually arise from faults in instruments and tank capacity tables are more serious as they occur in one direction only and may be cumulative. Here again the adoption of good standard methods and apparatus will do much to prevent systematic errors occurring.

Accurate measurement also provides a simple method of evaluating losses. Other methods depending on the accurate determination of small changes in physical properties of the oil, for example the determination of small changes in vapor pressure by the Chenicek Whitman vapor pres-

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STATE MONOPOLY VS. PRIVATE ENTERPRISE IN BRAZIL

By Robert G. Walker

THE search for petroleum in Brazil, conducted under the direction of the government, led to the discovery of the first producing well at Lobata, in the State of Bahia, in 1939. Since then the National Petroleum Council, created in 1938, has opened five other oil fields in the same state. Seventy-eight wells, with a potential yield of 11,600 barrels daily, are now producing in Bahia, and the reserves are estimated at 17.8 million barrels. In practice the output is limited to about 3,800 barrels daily in order to ensure economic exploitation of the wells. Work has been started on the first refinery, a combination topping and cracking unit, with a capacity of 2,500 barrels which is to be doubled in the near future. Gasoline and fuel oil will be produced first, then kerosene and diesel oil, and by 1953 it is hoped to supply 40 percent of the lubricating oils consumed in Brazil.

Meanwhile prospecting continues in the north of Bahia over an area of 11,580 square miles and in the adjoining states of Alagoas and Sergipe, where three new wells are being drilled. Geological surveys are proceeding in the Parana and Amazon basins, in the states of Piauhy, Maranham and Goias, and on Marajo Island. In all these areas prospects are considered favorable, and the sites for experimental borings are soon to be selected.

Throughout the war years the National Petroleum Council continued its investigations but made slow progress with development. Funds placed at its disposal were insufficient for more extensive exploration and essential equipment was difficult to obtain. In 1943 President Roosevelt appointed the Taub Mission to study the possibilities of industrialization in South America with a view to relieving the pressure on Allied resources. The Mission drew up a ten-year plan for Brazil, embracing the activities which it considered most conducive to economic independence, including development of the petroleum industry. It estimated at $80,000,000 U. S. the sum required for the exploitation of impregnated schists, installation of refineries to handle 7,000 barrels daily, and of plant to produce kerosene, heavy and light fuel oils and aviation spirit. The Mission emphasized the paramount importance of developing Brazil's oil industry for international and domestic reasons. The Taub plan was not put into operation, but interest in Brazilian oil increased after the war, owing to the threatened shortage in the western hemisphere and to the danger that supplies from the Near East might be interrupted. The question of development was taken up energetically by the present government, when it assumed office in January 1946. The United States Economic Mission, under John Abbink, made a study recommending that Brazil's sources of petroleum be fully exploited in order to improve road transport and facilitate the substitution of diesel engines for coal-burning locomotives on the railways.

The existing petroleum statute was drawn up in accordance with the nationalist spirit of the 1937 Constitution. It places all branches of the industry directly under the federal government and restricts concessions for refining to companies in which the capital is subscribed and the direction and management exercised exclusively by native-born Brazilians. This complete exclusion of foreign participation seems to preclude the possibility of rapid and efficient development, and new legislation has been drawn up in accordance with the more liberal Constitution of 1946. The latter, referring to authorizations to exploit mineral resources, merely restricts them to Brazilians or to societies organized in the country.

The revised law was submitted to Congress in February 1948 but encountered an intense campaign in favor of complete nationalization in the press, in parliament and on the public platform. Nationalists demanded a state monopoly which would exclude private enterprise altogether. Certain financial interests advocated an open-door policy permitting free competition. Military leaders, obeying the joint American - Brazilian plans for defense of the continent, strongly opposed free competition. The Communists ranged themselves alongside the Nationalists, and acting under orders from Moscow, vociferously clamored for a state monopoly, with the two-fold object of excluding United States participation and retarding development. Posing as ardent patriots they adopted a slogan, "Petroleum is ours," which caught the popular fancy to some extent and profusely decorated the walls of Rio's streets some months ago.

After January 1948, when the representatives of the Communist party were excluded from the legislative assemblies, opposition to the bill weakened in the Senate and Chamber of Deputies but was carried on with even greater violence outside those bodies. Confusion was created in the public mind by the spread of misleading interpretations of the bill. A meeting of the Nationalists was turned into disorder by Communist manouvers. Fighting broke out and nearly led to conflict between the military and the police, due to false rumors disseminated by the Communists.

The proposed law which is arousing such bitter disagreement makes petroleum deposits state properties which may not be alienated. It requires that production be applied first of all to domestic use and provides for the preservation and building up of natural reserves of crude oil and the progressive nationalization of the industry. Concessions may not be granted for periods exceeding forty years, and when they lapse or expire, the materials and installations will revert to the government without indemnification.

The government recognizes that it is essential to open new sources of petroleum for national and international use and that Brazil may become a large-scale producer in the near future through the association of national and foreign capital under state supervision. It maintains that the bill amply protects national interests, while offering adequate guarantees to foreign capital. This official view is shared by the army leaders and by a majority of the two principal political parties in the Senate and Chamber of Deputies. It is strongly opposed by the followers of Dr. Getulio Vargas, the late dictator, by the Republican party under ex-President Arthur Bernardes, and by obstructionists in the lower chamber.

At the time of writing the bill is still facing a difficult situation in the Chamber, but some months ago General Dutra's patience gave out. He decided that development should be held up no longer by political obstruction and made arrangements to accelerate it. To this end France will supply two refineries and the materials for pipelines. One of the refineries is to be erected at Belem, Para, to handle 45,000 barrels of imported crude oil; the other will amplify the Bahia plant, enabling it to refine 5,000 barrels of national petroleum per day. Both will be owned and operated by the federal government. The pipeline will be built and exploited by the state-owned Santos-Jundiai Railway between the port of Santos and San Paulo, with branches to distributing and processing centers within a range of six miles. The Union will also acquire and operate a fleet of tankers with a total carrying capacity of 180,000 tons. Six of these vessels will be built in Brazilian shipyards, and the remainder will be purchased in Spain, Holland and Belgium. In addition facilities are being afforded to two entirely Brazilian companies to enable them to obtain refineries from Czechoslovakia and the United States. These will be exploited by the companies concerned, one at San Paulo to handle 20,000 barrels and the other at Rio de Janeiro to deal with 10,000 barrels of crude oil daily. All materials purchased in Europe will be paid for out of Brazil's accumulated funds in the supplying countries.

General Dutra's action, which is in accordance with the proposed new law, has to some extent silenced those who were deliberately arousing public opinion, although an attempt has been made to raise a scandal by charges of favoritism against the Minister of Finance in connection with the concessions granted to the two private companies, and the result may be further delay in final action on the bill.

PEAK PROFITS FOR OIL IN 1948 WERE LARGELY REINVESTED

By Henry E. Rose

SALES of record volume, together with higher prices for crude oil and refined products, yielded peak profits for the American oil industry during 1948. Such profits for leading companies engaged in all phases of the industry were 50 percent greater than in 1947, the previous peak year, and 222 percent higher than in 1937, the pre-war peak year.

Last year the oil industry supplied a total demand for products (domestic and export) averaging 6,129,000 barrels daily, an increase of slightly more than four percent compared with 1947 and 43 percent above 1941, the pre-war peak year. It supplied, in 1948, about 2,100,000 barrels more daily than it did in 1941.

For the early months of this year operations were somewhat below those in 1948 because of the mild winter weather and the lack of a normal demand for fuel oils. The indications are, however, that the full year 1949 will produce an increase in demand of approximately five percent over last year, and thus set a new record.

The decline in demand for fuel oils in the early months of 1949 carried with it a softening in prices. Gasoline prices, on the other hand, remained steady and, in fact, have moved up.

These adjustments in operations, specifically the decline in demand for fuel oil and resulting lower prices, have made necessary cutbacks in crude production, especially in Texas. For most of 1948 the industry had been producing crude oil at maximum rates in order to meet the then high demand for products. Today, because of such cutbacks and new discoveries, the industry has a potential surplus production of about 900,000 barrels daily, or about what it was in 1914.

Overall, the financial operations of the industry in the first three months of this year resulted in profits below those in the corresponding period of 1948 due principally to lower prices for fuel oils, higher operating costs and a decline in demand. The first thirty companies to issue reports for the March quarter of this year had net profits aggregating $240,289,769 compared with $293,038,968 in the same period of 1948, a reduction of 17.9 percent.

Only four of the thirty companies had increases in profits in the first quarter of this year; namely, Ashland Oil & Refining Co., Barnsdall, Standard of California and Texas Co. For the remaining companies the reductions ranged from small amounts to as much as 50 percent in the case of three companies.

Standard Oil Co. (N. J.) issued an estimate of its net earnings in the March quarter of $75,000,000, equal to $2.53 a share of outstanding capital stock. It gave no comparison for the same period in 1948, but in the first six months of last year, the company estimated its earnings at $210,000,000, equal to $7.50 a share.

In the accompanying tabulation the thirty companies are shown with their net income and per share earnings on common for the initial three months of this year compared with the similar period in 1948:

For all of 1948 the net profits of twenty-three leading American companies used by WORLD PETROLEUM in its annual compilation amounted to $1,955,320,893 after all charges, including taxes. These profits, at a new record, were 50 percent higher than the $1,303,784,540 earned in 1947, the previous peak. Related to common stock outstanding, those for 1948 were equal to $9.31 a share (209,337,740 shares) after allowing for preferred dividends paid out by six companies having such shares outstanding. For 1947 the earnings on common shares were equal to $6.37 each on 202,722,565 shares, while in 1946 they were equal to $4.05 a share.

As contrasted with the record pre-war profits for the same companies—$607,404,000 in 1937—last year's net earnings on a vastly increased volume were up by 222 percent.

All companies had higher profits in 1948 against the previous year, the gains ranging from 30 percent to more than 100 percent in the case of Atlantic Refining Co., with a net 124 percent.

Standard Oil Co. (N. J.) headed the list with the largest profits of $365,604,976, equal to about $1,000,000 a day, and working out to $12.44 a share of its outstanding capital stock. Eight other companies reported profits in excess of $100,000,000 each last year.

Coincident with higher profits earned in 1948, the aggregate cash payments in dividends on common shares hit a new high at $507,129,325. The percentage paid out in proportion to actual earnings, however, was the smallest in many years—25.9 percent. For 1947 cash dividend payments amounted to $448,071,989, equal to 34.7 percent of earnings in that year, and in 1941, the last pre-war year, they were equal to 45 percent.

TABLE 1

First Quarter Earnings 1949 and 1948 of 30 Companies.

	1949 Net Income	1949 A Share on Common	1948 Net Income	1948 A Share on Common
Anderson Prichard	$ 1,272,619	$1.56	$ 1,607,319	$1.98
Ashland Oil & Ref.	2,024,279	1.13	1,195,686	1.09
Atlantic Refining	7,729,027	2.73	8,179,680	2.89
Barnsdall	3,619,055	1.74	3,385,780	1.52
Continental	10,834,635	2.25	13,849,543	2.92
Deep Rock	475,000	1.19	846,409	2.11
Gulf Oil	26,973,000	2.37	38,517,000	3.39
Houston	1,522,411	1.39	1,695,603	1.54
Lion Oil	2,222,779	1.90	2,988,848	2.55
Mid-Continent	3,357,831	1.81	7,007,163	3.77
Ohio	9,941,421	1.51	12,447,155	1.90
Pacific Western	1,066,049	.77	1,466,982	1.07
Phillips	12,713,254	2.10	18,154,148	3.00
Plymouth	1,375,909	1.34	1,669,961	1.60
Quaker State	467,338	.50	963,852	1.04
Seaboard	1,593,273	1.30	1,971,078	1.60
Shell Union	21,421,909	1.59	28,980,283	2.15
Skelly	7,783,921	6.56	8,960,029	7.55
Socony-Vacuum	26,000,000	.82	33,000,000	1.06
Standard of California	37,389,082	2.74	37,106,904	2.85
Standard of Kentucky	3,242,000	1.24	3,120,000	1.20
Standard of Ohio	3,912,960	1.03	6,052,604	1.66
Sunray	2,755,427	.45	4,129,840	.78
Superior (*)	2,502,380	5.92	5,118,535	12.10
The Texas Co.	28,870,111	2.09	27,974,839	2.08
Texas Gulf Pdcg.	773,541	.75	1,074,936	1.06
Texas P. C. & O.	1,659,159	.94	1,801,799	1.02
Tide Water	9,020,206	1.38	11,163,000	1.71
Union	7,403,136	1.54	7,795,006	1.62
Univ. Consol.	568,057	2.04	814,986	2.92
Total 30 Cos.	$ 240,289,769		$ 293,038,968	
Standard Oil Co. (N.J.)	$ 75,000,000	$2.53	N.A.	

(*) For three months ended February 28.
(N.A.) Not available.

The largest cash dividend payments were made by Humble Oil & Refining Co. last year of $71,902,720, or at the rate of $4 a share compared with $3 in 1947. Ranking second was Standard Oil Co. (N. J.) which paid out $55,899,204, or $2 a share against $4 in 1947. In addition to the cash payment Standard disbursed a stock dividend of five percent.

All companies with the exception of Standard (N. J.), Socony-Vacuum, Texas and Sun increased their cash payments in 1948 over 1947. The actual cash payments by the latter three were unchanged from 1947, but all, including Jersey, paid stock dividends in addition to their cash disbursements.

The need for large amounts of capital funds to provide for new and expanded facilities was the chief reason for the smaller relative cash payments in dividends in spite of the sharply higher earnings. It is significant, however, that more companies paid stock dividends than in any other year; such dividends being either in their own shares or holding of shares of other companies. Besides the four companies mentioned above, other companies to pay stock dividends in addition to cash included Gulf, Skelly, Standard of Cal., Standard of Ohio and Standard of Ind.

Traditionally the oil industry has expanded its facilities through plowing back a substantial proportion of its earnings rather than to incur heavy indebtedness, or sell senior securities to provide the necessary capital for this purpose. This policy has served the industry advantageously. It enabled it to carry on throughout the war by providing adequate supplies of products for all war needs at prices far below those obtaining for most other commodities.

In the past two years the industry has invested the record sum of more than $4,000,000,000 in new and expanded facilities in the United States, alone, and this at a time when inflated costs had an adverse effect on purchasing power. The cost of new and expanded construction today is about double what it was before the war. In other words, today's dollar will purchase only half the facilities that it did in prewar times. In immediate prewar years, in contrast, the industry invested an average of $700,000,000 annually, or one-third of what it is investing now.

Many companies in reporting to their stockholders have commented on the "apparently" high earnings in 1948 and how their purchasing power has been affected by inflated costs. Tide Water Associated Oil Co., as an instance, said that the funds required for general corporate purposes now are much greater than in the war years of 1942-1945.

"Present construction costs," it added, "exceed similar 1942 costs by a substantial amount and inasmuch as the normal operations of the company's properties involve large annual expenditures for replacement of plants and equipment, some of which had been deferred during the war years, the company's requirements of funds for such purposes have increased considerably. Current earnings must be considered in the light of the present purchasing power of the dollar.

"Capital extinguishments, chiefly depreciation and depletion, are based on cost of assets consumed or employed in operations. Inasmuch as most of the present assets were acquired at the lower costs in effect in prewar years, the charges against earnings for depreciation and depletion of such assets are commensurately low."

Ohio Oil Company commented: "Under the present sharply inflated price level, there is an imperative need for retaining a large proportion of the funds derived from profits for use in company operations. Continuous expenditures must be made for property replacement. Under a reasonably stable price level, funds for normal replacement of property and plant are provided by setting aside from the total income received an amount which represents the estimated cost of properties used up or worn out during the year."

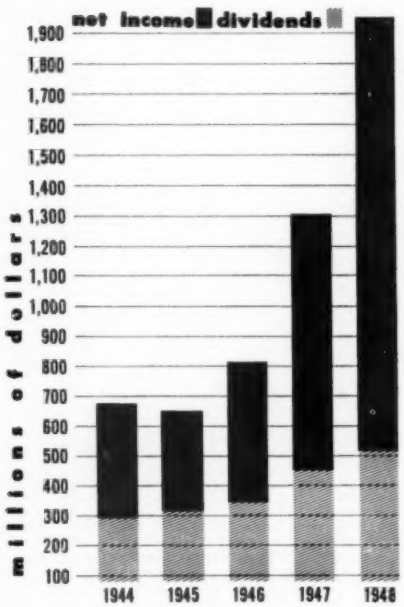
In reporting to its stockholders, The Texas Co. said: "Our 1948 earnings were at an all-time high. However, it was necessary for us to retain a large portion of our earnings to provide for investment expenditures. These included exploration and development of producing properties, new and modernized refineries, pipe lines, marketing facilities, new tank ships and investments in non-subsidiary companies.* * * Present costs of finding new crude oil reserves and of replacing obsolete and worn out facilities are more than double 1939 costs. Because charges for depreciation, depletion and amortization are based on original costs, amounts provided by these are inadequate to replace these assets at current high costs. A large part of the earnings, therefore, must be reinvested to overcome this deficiency and to provide funds for expansion to meet an increased demand for our products and to improve quality to assure our competitive position."

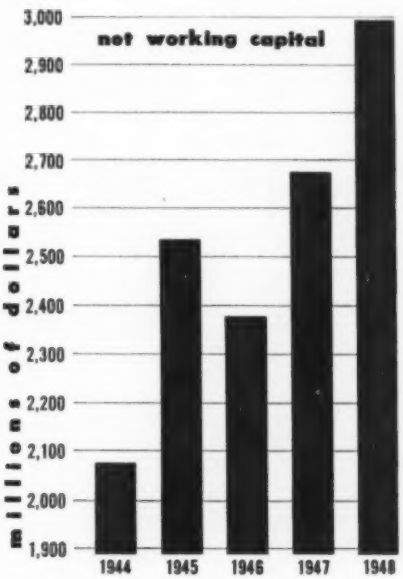
An indication of the huge expenditures made by oil companies in the past two years is evident in the reports of nineteen of the twenty-three companies. Those nineteen companies invested a total of $2,465,855,449 for capital purposes in 1948, including properties in foreign countries, compared with $1,899,660,865 in 1947.

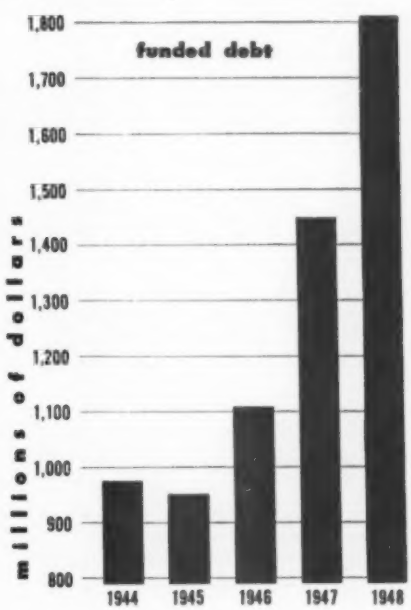
For several companies the portion of earnings retained after the payment of dividends was inadequate to provide all the funds necessary for

(Text continued on page 80)

Comparison of net working capital, funded debt, net income and dividends paid by 25 oil companies for the past five years.







FIVE YEARS FINANCIAL REVIEW OF

	Net Income	Per Share of Com.	Net Working Capital	Net Capital Assets	Funded and or Long Term Debt	No. of Pref. Shares	No. of Com. Shares	Surplus
Amerada Corp.								
1948	$22,642,252	$14.35	$23,503,669	$32,131,671	.....	.....	1,577,350	$44,824,883
1947	14,919,626	9.46	19,050,060	23,891,321	.....	.....	1,577,350	31,646,731
1946	8,855,975	5.61	12,911,224	20,080,891	.....	.....	(D) 1,577,350	21,459,154
1945	5,396,770	6.84	9,471,634	17,225,600	.....	.....	788,675	15,560,710
1944	5,285,988	6.70	8,566,051	15,927,801	.....	.....	788,675	13,585,670
Atlantic Refining Co.								
1948	35,657,124	12.68	$49,636,811	251,779,652	$37,890,000	499,990	2,666,911	159,978,172
1947	15,897,652	5.32	57,559,600	224,124,689	34,210,000	500,000	2,660,867	131,137,496
1946	9,632,926	3.26	43,317,784	205,560,012	37,211,229	148,000	2,663,998	121,547,604
1945	1,509,167	.34	46,293,657	189,688,970	40,179,220	148,000	2,663,998	115,626,758
1944	14,710,913	5.30	45,675,417	192,279,722	31,009,123	148,000	2,663,998	118,061,797
Barnsdall Oil Co.								
1948	13,473,629	6.06	12,639,682	29,348,473	.....	.....	2,223,307	31,276,725
1947	9,119,030	4.10	11,848,245	23,417,011	.....	.....	2,223,307	24,453,607
1946	5,113,811	2.30	9,056,280	19,222,629	.....	.....	2,223,307	17,666,642
1945	4,389,779	1.97	6,533,192	17,798,321	.....	.....	2,223,307	13,717,216
1944	3,674,766	1.65	5,498,163	15,977,894	.....	.....	2,223,307	10,861,185
Continental Oil Corp.								
1948	54,316,729	11.24	59,351,453	136,635,762	1,475,475	.....	4,823,458	185,594,215
1947	31,356,663	6.61	38,971,853	119,081,476	1,790,493	.....	4,747,155	144,615,436
1946	19,013,899	4.05	30,938,190	109,472,845	1,118,925	.....	4,694,251	123,359,887
1945	15,142,870	3.23	21,367,915	107,941,335	2,101,890	.....	4,682,557	111,885,294
1944	12,020,527	2.57	20,132,843	88,999,748	1,518,244	.....	4,916,987	103,234,221
Creole Petroleum Corp.								
1948	198,655,625	7.48	19,077,025	440,614,942	.....	.....	25,873,510	395,529,639
1947	130,750,261	5.06	29,956,350	313,568,324	.....	.....	25,865,110	199,636,860
1946	83,305,686	3.13	55,863,445	233,193,158	.....	.....	26,606,610	142,329,526
1945	64,601,781	2.43	47,301,411	160,296,022	.....	.....	26,606,610	105,585,408
1944	62,020,396	2.33	37,850,361	166,578,162	.....	.....	26,606,610	74,241,889
Gulf Oil Co.								
1948	183,539,299	13.53	213,486,462	661,757,676	184,874,046	.....	11,345,250	482,097,887
1947	95,540,059	10.53	129,541,065	577,529,002	184,601,035	.....	9,076,202	307,683,569
1946	58,284,830	6.42	83,221,420	485,799,531	59,872,985	.....	9,076,202	225,865,332
1945	45,213,640	4.98	91,459,870	446,736,575	49,360,719	.....	9,076,202	208,315,592
1944	42,075,513	4.64	101,635,902	409,833,584	48,443,118	.....	9,076,202	181,254,656
Humble Oil & Refining Co.								
1948	186,068,579	10.35	159,983,661	560,663,995	49,491,900	.....	17,975,680	(B) 198,820,415
1947	124,106,877	6.90	116,481,276	481,690,757	42,366,492	.....	17,975,680	259,654,556
1946	71,831,758	4.00	92,101,800	437,500,998	42,739,798	.....	17,975,680	(E) 189,474,719
1945	70,895,066	3.94	101,848,186	384,198,125	43,613,457	.....	17,975,680	269,853,441
1944	60,525,774	3.37	82,299,423	353,559,531	42,662,491	.....	17,915,680	221,796,955
Imperial Oil, Ltd.								
1948	22,832,970	.84	116,575,101	96,938,105	30,000,000	.....	27,121,405	133,829,490
1947	20,464,381	.75	67,164,791	76,561,041	24,000,000	.....	27,090,590	72,161,425
1946	17,326,112	.64	61,532,933	54,862,144	.....	.....	26,965,078	65,549,119
1945	16,616,586	.61	74,521,062	38,333,859	.....	.....	26,965,078	60,296,592
1944	16,192,670	.60	74,702,544	38,879,829	.....	.....	26,965,078	59,441,568
Mid-Continent Petroleum Corp.								
1948	24,681,992	13.28	47,819,261	65,371,738	.....	.....	1,857,912	99,219,111
1947	17,638,933	9.49	42,257,012	52,318,269	.....	.....	1,857,912	73,547,597
1946	10,084,581	5.43	36,546,658	44,163,951	.....	.....	1,857,912	61,578,530
1945	8,062,792	4.34	34,829,652	41,594,097	.....	.....	1,857,912	56,581,775
1944	6,942,038	3.74	35,820,077	37,201,893	.....	.....	1,857,912	54,341,653
Ohio Oil Co.								
1948	49,333,158	7.52	44,952,972	111,654,130	.....	.....	6,563,377	75,087,496
1947	29,161,496	4.44	40,339,466	95,033,850	3,000,000	.....	6,563,377	59,576,609
1946	18,253,236	2.78	42,575,885	81,024,999	8,000,000	.....	6,563,377	41,379,020
1945	13,949,822	2.13	37,001,770	79,673,840	9,500,000	.....	6,563,377	61,804,212
1944	15,082,127	2.30	30,683,091	80,316,287	11,000,000	.....	6,563,377	44,417,766
Phillips Petroleum Co.								
1948	72,630,997	12.01	72,811,100	395,573,350	99,793,245	.....	6,046,917	179,240,920
1947	40,893,647	8.11	66,276,074	291,393,262	41,884,723	.....	6,045,106	124,039,395
1946	22,625,151	4.60	44,550,509	236,560,087	43,433,211	.....	4,916,987	94,182,086
1945	22,571,509	4.59	42,310,294	222,698,646	45,989,518	.....	4,916,987	81,390,909
1944	26,952,088	4.26	30,782,672	235,972,999	48,812,688	.....	4,916,987	68,853,374
Pure Oil Co.								
1948	41,672,136	9.91	57,696,334	181,984,681	30,665,823	442,434	3,982,031	127,223,015
1947	21,197,069	4.77	49,952,231	157,628,084	32,556,242	442,434	3,982,031	95,026,757
1946	17,107,961	3.74	52,038,916	136,931,651	31,064,611	442,434	3,982,031	82,013,518
1945	13,581,770	2.64	55,486,989	126,537,915	32,670,992	442,434	3,982,031	72,094,085
1944	16,392,178	3.11	40,060,767	(A) 133,029,554	2,415,808	725,431	3,982,431	(A) 67,813,020
Seaboard Oil Co.								
1948	6,780,713	5.52	8,290,539	13,028,979	.....	.....	1,226,390	18,548,772
1947	5,941,002	4.83	8,184,998	8,784,163	.....	.....	1,229,230	14,226,425
1946	3,000,586	2.43	4,769,046	8,557,413	.....	.....	1,234,232	10,133,008
1945	2,720,022	2.20	3,332,211	8,508,948	1,733,333	.....	1,234,233	6,663,989
1944	1,881,284	1.52	3,452,654	7,841,302	2,433,333	.....	1,234,235	5,178,190

UNITED STATES OIL COMPANIES

	Net Income	Per Share of Com.	Net Working Capital	Net Capital Assets	Funded and or Long Term Debt	No. of Pref. Shares	No. of Com. Shares	Surplus
Shell Union Oil Corp.								
1948	$111,396,447	$8.27	$128,595,023	$333,981,804	$121,797,000	.....	13,470,625	$161,846,396
1947	59,874,698	4.44	114,673,825	276,657,900	122,995,000	.....	13,470,625	104,719,558
1946	32,880,417	2.44	179,579,959	191,962,583	124,000,000	.....	13,470,625	63,253,766
1945	28,712,328	2.13	146,416,443	175,254,538	81,641,000	.....	13,470,625	50,579,277
1944	28,163,961	2.09	114,096,944	213,471,518	84,873,000	.....	13,470,625	50,464,897
Sinclair Oil Corp.								
1948	$1,048,692	6.76	185,922,695	387,116,078	179,588,687	.....	11,974,003	350,838,098
1947 (F)	52,432,125	4.37 (F)	188,291,519	(F) 333,553,008	(F) 181,371,677	.....	11,974,021	(F) 294,424,410
1946	27,607,645	2.30	148,524,551	242,091,785	108,431,680	.....	11,924,041	245,819,783
1945	15,644,749	1.30	158,722,855	213,268,030	110,475,065	.....	11,974,058	230,182,487
1944	27,367,794	2.28	92,255,494	241,573,524	61,706,525	.....	11,974,094	226,508,979
Skelly Oil Co.								
1948	38,914,350	36.04	31,846,707	109,483,085	14,800,000	.....	1,079,476	111,635,500
1947	21,090,936	21.49	21,912,251	88,030,205	15,600,000	.....	981,342	77,887,985
1946	10,108,765	10.30	16,291,391	74,599,381	16,400,000	.....	981,348	59,256,404
1945	8,531,274	8.69	16,597,603	67,161,858	17,200,000	.....	981,349	51,104,336
1944	7,222,903	7.36	11,541,852	58,319,784	10,000,000	.....	981,349	44,535,759
Socony-Vacuum Oil Co., Inc.								
1948	132,580,055	4.18	270,386,514	732,890,440	185,000,000	.....	31,801,880	542,764,612
1947	97,708,927	3.13	265,646,171	637,748,563	140,000,000	.....	31,178,319	456,406,319
1946	58,310,569	1.87	266,082,299	577,619,321	125,000,000	.....	31,178,323	379,813,495
1945	42,301,983	1.36	274,222,734	509,955,895	100,315,279	.....	31,178,323	321,695,393
1944	62,349,556	2.00	280,510,156	511,462,595	118,077,823	.....	31,708,452	229,999,725
Standard Oil Co. of California								
1948	161,491,932	12.42	171,851,490	689,563,058	107,217,702	.....	13,654,150	467,365,679
1947	107,268,575	8.25	163,273,784	606,611,265	44,796,559	.....	13,003,953	384,447,313
1946	66,956,611	5.15	90,373,940	519,861,157	40,000,000	.....	13,003,953	320,734,788
1945	55,548,628	4.27	113,442,810	473,027,029	38,500,000	.....	13,003,953	284,503,528
1944	43,467,997	3.34	122,616,220	466,865,826	40,000,000	.....	13,003,953	260,871,654
Standard Oil Co. of Indiana								
1948	140,079,286	9.16	197,319,086	975,759,328	249,464,586	.....	15,284,793	636,601,618
1947	94,880,715	6.21	199,715,280	797,689,716	174,346,231	.....	15,284,806	542,749,899
1946	67,649,785	4.43	189,970,815	637,231,383	66,982,830	.....	15,284,830	478,439,433
1945	50,340,476	3.29	222,713,624	536,228,098	19,303,641	.....	15,284,860	437,538,439
1944	59,225,578	3.87	181,904,301	539,352,256	12,042,641	.....	15,284,864	409,881,287
Standard Oil Co. (N. J.)								
1948	365,604,976	12.44	659,838,746	1,858,675,283	230,426,922	.....	29,385,435	1,430,465,470
1947	268,626,580	9.83	690,068,515	1,524,122,335	218,503,349	.....	27,333,742	1,134,478,936
1946	177,609,931	6.50	739,031,209	1,274,429,578	198,206,986	.....	27,333,742	971,978,085
1945	154,156,196	5.64	779,818,746	1,137,441,311	203,129,907	.....	27,333,742	857,287,258
1944	155,396,460	5.69	697,078,842	1,103,125,811	214,855,260	.....	27,333,742	697,078,482
Standard Oil Co. of Ohio								
1948	23,783,197	6.39	67,139,680	112,937,258	36,694,040	248,550	3,572,693	88,826,256
1947	16,390,585	4.41	36,823,998	101,377,991	16,257,965	253,035	3,564,835	72,863,521
1946	10,324,797	3.43	30,662,528	84,744,061	16,711,835	252,000	2,737,074	50,138,079
1945	3,713,161	1.10	39,045,305	76,463,002	16,566,863	238,665	(C) 2,676,383	42,686,806
1944	6,744,014	7.07	24,173,817	74,989,555	20,199,617	221,389	807,585	41,466,795
Sun Oil Co.								
1948	42,853,839	8.61	56,413,643	159,135,242	829,494	93,197	4,996,721	54,318,208
1947	24,339,913	5.28	47,718,318	136,500,595	1,005,648	93,197	4,528,532	42,155,774
1946	14,726,551	4.17	49,662,405	114,622,553	6,750,914	93,197	3,434,944	38,452,703
1945	15,666,543	4.44	47,936,056	102,480,572	4,588,218	93,197	3,434,944	25,798,504
1944	13,350,217	4.15	60,254,429	110,955,911	34,739,756	93,197	3,119,582	27,344,493
The Texas Co.								
1948	165,960,980	12.03	357,156,851	[illegible]	164,208,610	.....	13,797,624	609,058,805
1947	106,312,617	7.90	363,780,648	487,204,696	146,846,291	.....	13,461,096	492,110,494
1946	71,089,267	6.32	131,027,329	413,885,965	147,093,063	.....	11,244,669	359,482,341
1945	51,856,928	4.61	186,332,038	398,787,324	114,498,906	.....	11,244,660	316,801,859
1944	54,516,819	4.85	176,565,106	431,750,673	124,600,469	.....	11,244,660	293,056,581
Tide Water Associated Oil Co.								
1948	39,387,374	6.04	54,708,056	168,523,625	.....	190,480	6,396,809	151,449,858
1947	30,175,955	4.57	55,535,548	153,000,270	4,500,000	225,373	6,396,809	125,748,023
1946	19,757,707	2.93	50,735,936	140,156,130	7,250,000	268,778	6,396,809	98,842,428
1945	18,107,712	2.57	48,056,917	140,459,899	14,250,000	287,887	6,396,809	84,937,733
1944	17,787,202	2.43	49,971,786	147,485,770	21,250,000	500,000	6,386,809	61,118,436
Union Oil Co. of California								
1948	31,293,147	6.51	49,727,187	194,501,941	54,400,000	250,000	4,666,270	69,947,452
1947	18,910,860	3.85	46,129,154	178,467,499	54,600,000	250,000	4,666,270	49,974,256
1946	9,804,523	1.90	45,265,922	166,822,441	40,000,000	250,000	4,666,270	37,370,429
1945	9,201,123	1.87	56,487,921	154,637,919	40,000,000	250,000	4,666,270	33,392,667
1944	8,932,994	1.91	34,357,126	168,599,514	53,700,000	.....	4,666,270	32,248,766

(A) Giving effect to writeoffs in November, 1944, of $19,523,031 of patents, rights, trademarks, etc.
(B) After transfer of $175,000,000 to capital stock account.
(C) Common stock split two-for-one in 1945.
(D) Stock split two-for-one early in 1946.
(E) After transferring $124,445,088 of prior year's earnings to capital stock account which is now carried at $300,000,000 against $175,000,000 at December 31, 1945.
(F) Adjusted to include the accounts of Venezuelan Petroleum Co. and subsidiaries.

CENTRIFUGAL COMPRESSORS COMPLETED FOR CARTHAGE HYDROCOL PLANT

TWO mammoth centrifugal compressors for the Carthage Hydrocol plant now being erected at Brownsville, Texas, recently passed their run-in tests at the Clark Brothers plant at Olean, N. Y. The compressors are the largest of their type yet built.

Because of the wide interest on the part of the public and the oil industry in the Hydrocol process, Clark Brothers invited technical press writers and other guests from all parts of the country to inspect the new equipment.

At a luncheon at the Olean Country Club prior to the plant inspection, E. O. Thompson of the Texas Railroad Commission hailed the Carthage plant as a significant step in the industry's progress in gas conservation. He foresees the time when wastage of casinghead gas will be completely halted, as has been accomplished in the case of dry gas. In his address General Thompson took occasion to say that all threat of an oil shortage in this country now is past. The magnificent work of the industry in the past year has not only closed the gap between supply and demand but has also partially rebuilt a necessary emergency reserve supply.

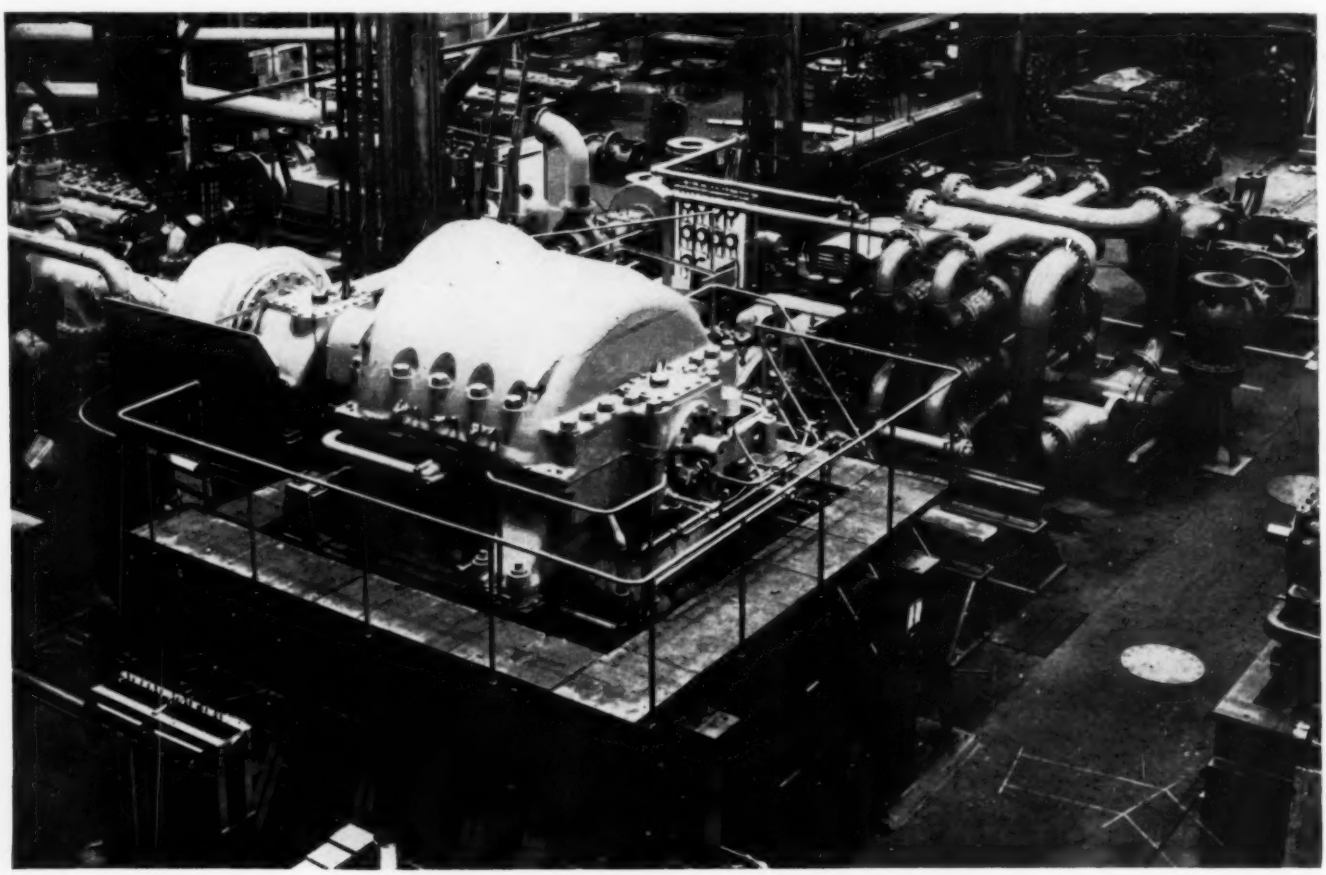
Francis W. Laverty, general sales manager for Clark Brothers, briefed the visitors on the Hydrocol process and the compressor test set-up before a tour of the Olean factory. He described in detail the ingenious method employed in testing the compressors at the plant without installing a large boiler capacity and steam turbine. The test set-up involves the use of a modification of one of Clark's standard angle reciprocating gas engine compressors and a gas turbine of the type which Clark has developed in cooperation with the affiliated Frederic Flader, Inc.

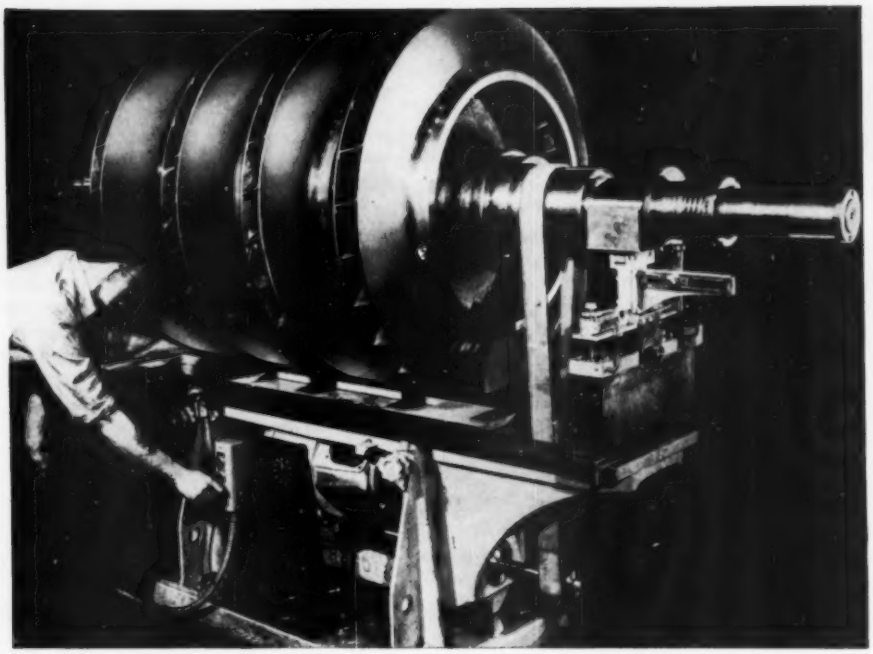
For the test work an eight cylinder, 1600 hp Clark engine was modified so that five cylinders with a separate manifold are utilized to compress air to 60 psig. This air is used as combustion air to supercharge the remaining three cylinders which are employed as gas generators. In the three gas generator cylinders three and one-half to four times the horsepower is developed as in standard cylinders, and the exhaust gas leaves the manifold at 50 psi and 850 to 900°F. A supplementary supply of hot gas is provided by an oil burner heating shop air and also discharging at 50 psi. The combined streams of exhaust gas are expanded in the reaction turbine, developing 2200 to 3000 hp at about 3900 rpm.

Each of the Hydrocol compressor units consists of three cases to be installed in tandem for drive through by a single steam turbine. Designed capacity is to compress 110,000 cubic feet of air per minute to 100 psig. The first two cases operate in parallel, the third acting as a second stage. Power requirement is 23,000 bhp.

A large number of other centrifugal compressors are to be installed in the Carthage plant being built to produce synthetic gasoline, diesel oil and other hydrocarbons from natural gas. A total of 24 units with an installed horsepower of over 80,000 will be employed to compress six different gases involved in practicing the Fischer-Tropsch synthesis. This will be the largest single installation of centrifugal compressors in the world.
In designing the various centrifugal compressors

Test stand at Clark Brothers plant with Hydrocol centrifugal compressor u nder examination preparatory to shipment.





Balancing rotor of 11,000 bhp compressor for Hydrocol.

C. P. Clark, president of Clark Brothers Co. since 1936 is the son of the founder of the company.

F. W. Laverty, general sales manager since 1946, has devoted the past 22 years to engineering and sales work for Clark.

for the Hydrocol plant, Clark engineers found it necessary to adopt some special non-ferrous metals in order to guard against the reactive nature of oxygen and to provide adequate intercooling between the various compressor cases. Internal parts of the oxygen compressors are made of a bronze alloy and are water cooled, a special bronze diaphragm being used to obtain a high rate of cooling.

The principle of the centrifugal compressor has long been recognized, but its application in industry on a large scale is of quite recent origin. In the petroleum industry, in natural gas transmission lines, and in gasoline and cycling plants compression has been almost entirely by reciprocating machines. Development of the gas turbine as a prime mover has stimulated research on centrifugal and axial flow compressors in the United States since the war. Clark Brothers, for example, began its development work on this type of compressor in 1944, some 39 years after the company began manufacturing engines for the oil industry and a quarter of a century after C. Paul Clark, now president of the company, began the development of Clark reciprocating compressors. First commercial Clark centrifugal compressors were completed in 1947, and later this year the company will produce its first gas turbine-driven compressor for gas line transmission work. The 5,750-hp unit is being built for Tennessee Gas Transmission Co. and is expected to have a thermal efficiency in excess of 30 percent. Centrifugal compressors have been in use on the "big inch" gas lines since the war, but are motor-driven, having been adopted largely as an emergency measure to get the lines in operation quickly because motors used on the big oil lines during the war already were in place and because delivery could be had on the centrifugals more quickly than on reciprocating machines. Large-scale use on gas lines is expected to depend on the economics of the gas turbine, however, and the Tennessee installation will be watched with great interest by both the gasoline and gas transmission industries.

During their trip through the Clark Brothers plant at Olean, the visitors learned that floor space and manufacturing facilities of the company have been about tripled since 1939. Facilities now are adequate to produce upwards of 60,000 bhp per month of gas and diesel engines and compressors.

TORQUE CONVERTER FOR THE OIL INDUSTRY

RECENTLY a new kind of appliance for the transmission of power from an engine to moving machinery has been made available to the oil industry. It is called a hydraulic torque converter and is based on a principle of dynamics that was first brought to light in 1905 by a German named Fottinger. In subsequent years the idea went through various stages of development and has been extensively employed in the automotive industry, first in the heavier vehicles such as buses and trucks and large crawler tractors; more recently it has been adapted to passenger cars such as the Buick Roadmaster.

A hydraulic torque converter is made up of three principal parts which are shown in the photograph reproduced in Fig. 1. These are called the converter pump, the converter turbine and the reaction member, which are single-piece aluminum castings comprising vanes or blades that direct the flow of the moving fluid—in this case an oil having certain flow and viscosity charac-

teristics. When these parts are assembled in a unit, power from the engine is transmitted from the flywheel through a gear-type coupling to an input shaft, and then through the cover of the pump to the converter pump. The reaction member is mounted between the converter pump and the turbine, which is mounted opposite the converter pump. The turbine is attached to the output shaft by means of a splined hub. The reaction member receives the oil after it leaves the turbine and redirects it to the pump.

The converter is filled with oil at all times. This oil is picked up by the pump blades, which are rotating at engine speed, and is forced outward and forward. This action corresponds very closely to the action of any centrifugal pump. The fluid enters the center and is discharged at the outside.

The oil leaving the pump enters the turbine, and its direction is reversed by the turbine blades. This then absorbs the power from the oil and transmits it through the turbine hub into the output shaft. This action is very similar to that which occurs in a water turbine, where the jet of water is reversed in direction and the power absorbed from it.

After leaving the turbine, the oil enters the stationary reaction member, and its direction is again reversed so that it may again enter the pump blades. This is true only while acting as a hydraulic torque converter. Whenever the output shaft is operating at approximately 83 percent of the engine speed or more, the oil leaving the turbine will strike the reaction member blades on the backside. At this time the free wheel unit will unlock and make the reaction member inoperative. The unit then acts as a hydraulic coupling with only the pump and the turbine transmitting the power.

The unit is designed to function both as a hydraulic torque converter and as a hydraulic coupling. The function of the reaction member is to supply torque and get the transmission of power started. When the transmission of power has reached a point where no further increase of torque is desired, the converter range ends and the coupling range takes over. The reaction member is so arranged that it becomes inoperative during the coupling phase; this effect is attained by mounting the reaction member on a stationary sleeve by means of a freewheeling unit. This permits rotation of the reaction member during the coupling range and prevents rotation during the torque converter range. Whether or not the reaction member rotates depends upon the direction from which the oil leaving the turbine impinges against its blades.

In addition to the main functional parts, the unit is equipped with an oil pump system comprising two pumps into one housing. The forward or pressure pump draws oil from an oil tank and forces the oil through the inlet passage into the converter proper. This oil also serves to lubricates the bearings. After circulating through the converter, the oil goes through an outlet passage to a pressure relief valve and then through a heat exchanger back to the oil tank.

The above description applies to the "Torcon" unit built by the Torcon Corporation. A simplified cross section of a Torcon unit is shown in Fig. 2.

The dominant feature of a hydraulic torque converter is that transition from the converter range to the coupling range is effected automatically by the characteristics of the unit, no outside controls being required. This combination makes it possible to operate at high efficiences over a wide speed range and to obtain high output-shaft speeds, permitting full utilization of the engine horsepower throughout the entire range of part-throttle to full-throttle operations. During the converter range the engine performs at a practically constant speed, making it impossible to stall the engine due to overload. After passing into the coupling range, the engine speed increases in nearly direct proportion to the output speed. The efficiency is comparatively high over a wide speed range, attaining 70 percent at 400 rpm output speed and remaining above this value for the balance of the speed range at full trottle. This is due to the combined functional advantages of the torque converter and coupling. For instance, at half throttle the converter range is reduced and the coupling range is correspondingly increased. This extends the higher efficiencies over an even wider speed range. Operation above 270 rpm will now be at efficiencies higher than 70 percent. Other part-throttle settings show comparable efficiencies.

These characteristics make the unit an ideal automatic transmission for such equipment as logging machinery, oil well machinery, locomotives, power shovels and road machinery. It allows of infinitely variable speed and torque ratios and automatic selection of the most effective torque multiplication. The engine cannot be overloaded or stalled, and the mechanism is simple enough to be serviced by the average mechanic.

This feature is of particular value in the normal operations of rotary drilling, where speed can be kept constant even with considerable variation of load, and where, when required, torque can be multiplied up to three to one without twisting off the pipe.

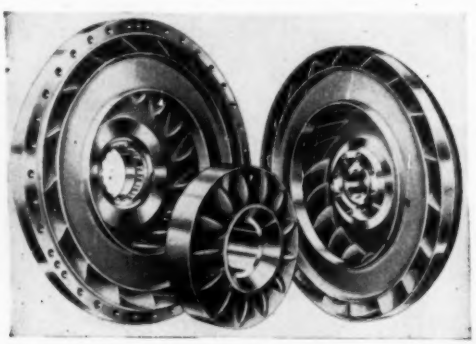


Fig. 1 Exploded view of converter pump, turbine and reaction member.

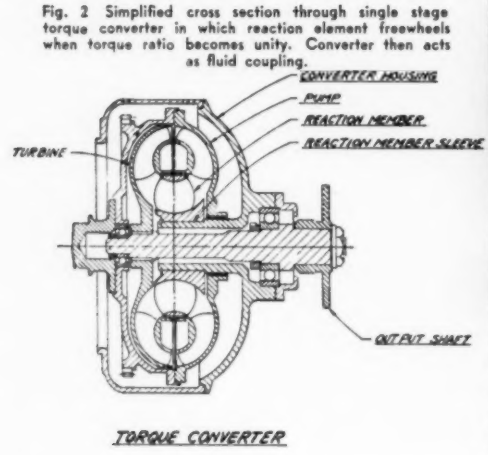


Fig. 2 Simplified cross section through single stage torque converter in which reaction element freewheels when torque ratio becomes unity. Converter then acts as fluid coupling.

TORQUE CONVERTER

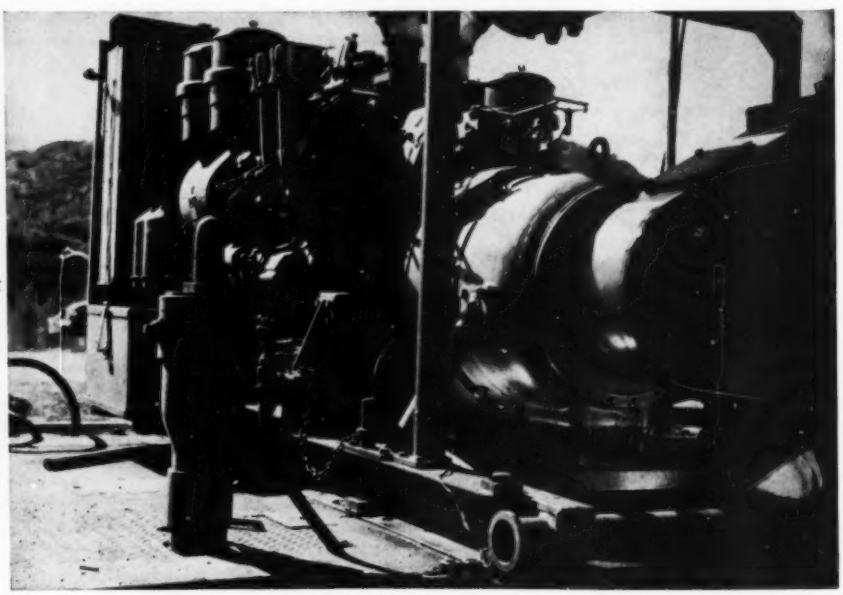


Fig. 3 Torque converter as applied to drilling rig.

SOVIET OIL MINISTER CRITICIZES INDUSTRY'S SHORTCOMINGS

IN A recent speech before the Supreme Council of the Soviet Union by M. K. Baibakov, Minister of the Oil Industry, as reported by Pravda, it was stated that Russian oil workers had made good progress during 1948 and had increased production over the preceding year by 13 percent. Several groups were singled out for favorable mention including those of the Grozny, Bushkirian, Kouibyshev, Krasnodar, Turkmenian, Uzbek and North Ossetian regions. These, together with the Ukranian gas workers, had fulfilled the 1948 phase of the current five-year plan ahead of schedule. The workers of the Kouibyshev, Turkmenian and Uzbek districts received special praise for completing the entire five-year program in three years.

During the year drilling increased 45 percent as compared with 1947, and a number of new oil and gas deposits were located. Refineries fulfilled the output plan for the year, and the production of equipment, including catalytic cracking equipment, portable rigs, diesels for drilling and many other types, attained the specified quota ahead of time. Further progress was made in deep well pumping, in flooding operations to maintain pressures, in the application of turbine drilling to vertical and inclined wells, in the mechanization of building operations and in new processes of refining.

With the growth of production, consumption increased considerably and the use of special products greatly exceeded the level of 1940. The payment of subsidies to the oil industry was discontinued and payments to the state budget out of profits amounted to 200 million rubles.

Along with his optimistic report on the general progress of the Soviet oil industry, the Minister included sharp criticism of its shortcomings in various respects. He said:

"At the same time there were serious defects in the work of the oil industry last year. In spite of the growth in production, the state plan for the oil industry as a whole was under-fulfilled. Non-fulfillment of the plan is partly connected with the unsatisfactory work of the 'Azneft' (Azerbaijan) combine. In this important oil region we have not yet overcome the difficulties inseparable from exploration for new oil areas, both on land and in the sea. For the organization of marine drilling operations we have not had either a big enough fleet or tonnage sufficient for the work of bringing in the oil fields underlying the Caspian Sea.

"In 1948, in spite of the improvement in the figures of the productive utilization of drilling times, stoppages, breakdowns and various difficulties continued to slow down drilling, particularly in Turkmenia, Kazakhstan, the Kouibyshev region and Sakhalin. Any further increase in oil production depends on the development of drilling. It is necessary to say that serious stoppages and breakdowns in drilling are due not only to poor qualifications on the part of various workers, their carelessness, or unsatisfactory organization of the work, but also to shortages of materials and technical supplies for the drilling work. We get good drilling rigs from the Ministry of Heavy Machinery Building and from other Ministries, and also from our own works, but we do not get adequate quantities of locks for drilling pipes, diesels and spare parts for these, turbo-drills, lengtheners and spare parts for drilling rigs. The drilling section is in serious need of assistance from the machinery builders.

"In the domain of oil refining a serious defect has been the nonfulfillment at a number of refineries of the plan for the whole assortment of products. Although they have over-fulfilled the plan for treating crude and for the output of the principal oil products, certain concerns have overlooked the necessity of reaching the target set for every kind of product and for the assortment as a whole. The machinery building works so far have failed to supply exploration workers with first-quality column bits, which is the cause of the extremely low percentage of cores obtained in exploration drilling, and which lowers the standard of the scientific-research work in respect of exploration. Scientific research is also behindhand in the domain of treating sulfurous crudes and in the underground gasification of low-calory coal. These extremely important problems demand the attention of the Academy of Science.

"Although there has been a general reduction of costs in the concerns of the Ministry, there has been an increase in the cost of producing oil as compared with the approved plan. This increase in cost is fundamentally connected with the nonfulfillment of the oil production plan due to all kinds of unproductive stoppages.

"During the present year the Ministry of the Oil Industry is faced with the task of raising oil production as compared with 1948 by 12.3 percent, gas production by 21 percent, the extent of drilling operations by 58 percent and the output of light products by 12.5 percent; of expanding the manufacture of oil machinery and tools, and of extending building and assembly work by 40.5 percent as compared with the 1948 level. We must greatly increase the volume of geological exploration and must continue to develop deep exploration drilling in the search for oil and gas in new regions. We must undertake measures which will ensure the growth of drilling speeds, especially in exploration drilling, and a considerable reduction in stoppages and breakdowns. In a number of regions in the drilling of deep exploration wells, we must change over from the rotor to the turbine method. The question of extending the front of drilling operations in the sea is of particular importance. Platforms for marine drilling must be constructed in accordance with industrial methods.

"In oil production we are faced with the problems of restoring the maximum number of idle wells to exploitation, especially in the 'Azneft'; the widespread application of secondary recovery methods of exploitation of oil fields, and also the further development of deep pump production."

In accordance with the usual Soviet practice, Minister Baibakov did not present specific figures on production, drilling and other operations for the past year but only comparisons with previous years. In Soviet industry generally an effort is being made to complete the current-five-year plan in four years so that a new plan may be adopted to start in 1950.

Soviet oil production in 1940 totaled 217 million barrels or about 593,000 barrels daily. During the war production declined steadily reaching a low of about 149 million barrels or about 410,000 barrels per day in 1945.

Premier Stalin announced at the close of the war that the first 5-year plan contemplated bringing production up to 247 million barrels or 675,000 barrels daily by 1950. The goal of the post-war 5-year plans is 430 million barrels or 1,175,000 barrels daily in 1960.

The Soviet government has not made a recent announcement giving production in detail. Several months ago it was stated, however, that production rose about 14 percent in 1948 as compared with 1947. General estimates are that U.S.S.R. production outside of Sakhalin averaged about 600,000 barrels daily in 1948; 525,000 barrels daily in 1947 and 451,000 barrels daily in 1946. This suggests that production for 1949 should approximate 640,000 barrels daily in order to maintain the recent rate of progress in production expansion and reach 675,000 barrels daily in 1950.

CONSTRUCTION BEGUN ON TRANSCONTINENTAL'S GAS LINE

By Don J. Kirkley

WORK on America's longest and largest single line gas pipeline got under way May 23 when Transcontinental Gas Pipe Line Corporation of Houston, began construction on the 1840-mile line from the Rio Grande to 132nd Street in New York City. As projected, initial deliveries of gas will start before 1950 ends, and the line will be completed by January 1, 1951, delivering fuel to distributing companies under allocations apportioned by the Federal Power Commission.

Claude A. Williams, president of Transcontinental, and Ray Fish, president of the Fish Engineering Co., and Fish Constructors, Inc., which will build the line, said that in the beginning deliveries will be 340 million cubic feet daily, although the line can be expanded to 500 million feet daily.

The gigantic line, a 30-inch trunk pipe most of the way, spans 11 states en route from McAllen, 15 miles north of the Rio Grande, to uptown New York. Seven compressor stations totaling 72,000 horsepower will be installed in the initial program. Thirteen others, making a total of 20 stations with 220,000 horsepower, ultimately will be required to operate the line at full capacity.

The program calls for 600 miles of the main line to be built this year. Six pipeline spreads will be used this year and 15 next year, when the final 1,200 miles are laid.

"We will build from Eunice, La., eastward to near Atlanta this year." Mr. Fish said. "Next year we will work northward from Atlanta and southwestward from Eunice into the Rio Grande valley. We have arranged for plenty of pipe."

Lt. Col. N. R. McKay, formerly with the Southern Natural Gas Co., of Birmingham, will be consulting engineer on the project. "By using 30-inch pipe instead of 24 or 26," Col. McKay said, "we can deliver gas in New York City at 31 cents, as contrasted to a prewar Atlanta gas rate of 40 cents. We couldn't do it if we had to use smaller pipe."

Application for construction of the line was filed December 11, 1946, and the requisite certificate of convenience and necessity was issued by the Federal Power Commission on May 29, 1948.

The line traverses the largest producing natural gas area in the United States, according to Mr. Fish, who places available gas reserves at 90 trillion cubic feet. Contracts for production and reserves assure an ample supply for 20 years.

Gas will be taken from fields in Texas and Louisiana, with three trillion cubic feet under contract. Fields to be tapped in the initial phases are Conoco-Driscoll and other fields in Texas, La Gloria, Starr County, Odom, Luby, Petronilla, Lacey, Quinto Creek, West Bernard, Bee County, Live Oak County, North Markum, North Bay City, and in Louisiana, West Gueydan, Egan, Fresh Water Bayou and surrounding areas.

The Texas Railroad Commission has approved the undertaking, as a substantial part of the carrier's supply will be "flare" gas from various oil fields along the line, "making this project another rung in the ladder of conservation," in the words of Mr. Fish.

Contracts for the sale of the gas have been negotiated with the Consolidated Edison Co., of New York, Brooklyn Union Gas Company, Public Service Co., of New Jersey, Philadelphia Electric Co., Long Island Lighting and Power Company, Kings County Light Co., Brooklyn Borough Gas Co., Richmond Gas Co., and the Elizabeth Town Gas Co.

Financing of the $190,000,000 company has been completed. All common stock, of which 50 percent is owned or controlled by Texas interests, was privately placed. In addition long-term bonds totaling approximately $143,000,000 were placed with several insurance companies.

The 1840 miles of main line pipe will be composed of 71 miles of 20-inch pipe, 559 miles of 26-inch pipe and 1,210 miles of 30-inch. From the starting point near McAllen, the line will run by Alice, Victoria, Houston and Beaumont, Texas; Lake Charles, La., crossing the Mississippi about 50 miles north of Baton Rouge. Approximately 400 miles of feeder and gathering pipe will also be laid. Turning east-northeast in Louisiana, the line will skirt Montgomery, Ala., Atlanta and Athens, Georgia, and then turn northerly past Spartanburg, S. C., Winston-Salem, N. C., Lynchburg, Va., go west of Washington, north of Baltimore, Philadelphia and Linden, then through Elizabeth and Newark into the 132nd Street terminus in New York City.

Some 470,000 tons of steel for the main line will come from the Kaiser Fontana plant and will be fabricated by Consolidated Western Steel Company of Los Angeles. Feeder pipe will be supplied by the A. O. Smith Corp., of Milwaukee. Placing of construction subcontracts began early in May. The 1949 program will require an expenditure of about $70,000,000. Contracts for 1950 will be placed later in the year.

Two river bridging operations are contemplated. One is over the Atchafalaya in Louisiana, approximately 4,000 feet, and the other over the Coosa in Alabama. The Mississippi and other rivers will be crossed by submerged lines, plans for the Mississippi calling for three 20-inch pipes sunk at bottom level.

Richard Ricketts, vice president of Fish Constructors, will be assistant to Mr. Fish during the construction period. Fish Constructors was formed as an affiliate of Fish Engineering to build the Transcontinental line.

Fish Engineering Corp. did all the basic engi-

Claude A. Williams, president, Transcontinental Gas Pipe Line Co.

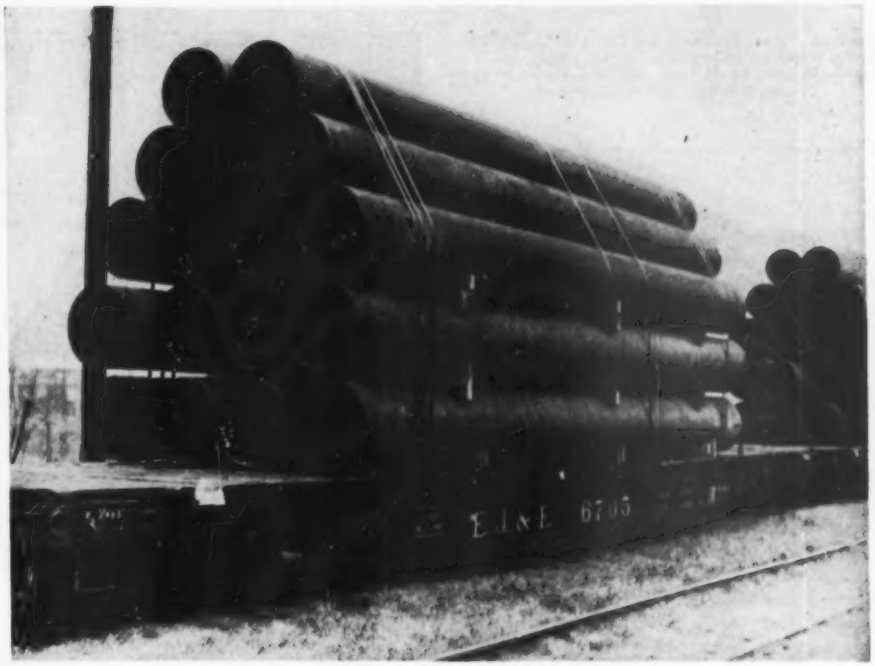
Ray C. Fish, president, Fish Engineering Co. and Fish Constructors Co.

neering work for presentation to the Federal Power Commission and the financial interests involved in the picture. The contract for the entire project, covering design, engineering and construction of all phases, given by Transcontinental to Fish Constructors, is considered the largest single contract of its kind in the gas industry.

"One thing we are sure of," Mr. Williams and Mr. Fish joined in saying in concluding a resume of their plans, "We could sell three times as much gas as we are going to sell if we could get it delivered in the New York area."

Completion of the Transcontinental line will give Texas three big capacity carriers to the Atlantic Coast industrial area. In addition is the line from west Texas to California. Texas presently is supplying gas to both the Pacific and Atlantic Coasts, as well as to the central territory through the several lines already built to that area. Enlargement of all these outlets is under way or projected.

Atlantic-bound lines are the Big and Little Inch lines of Texas Eastern Gas Co. and the Tennessee Co. El Paso Natural Gas, which now has a 26-inch line to the California area, is planning to spend $39,000,000 constructing a 30-inch parallel line about 635 miles long from Eastern New Mexico and the Panhandle of Texas. The Pacific Gas and Electric Co. takes over for West Coast distribution at the Colorado River south of Needles, Calif. Thus, the whole country is becoming tributary to Texas for a substantial part of its fuel and industrial power.



Thirty-inch pipe for Transcontinental line being moved from Consolidated Western Steel Co. plant at Los Angeles.

Map showing Transcontinental line with initial and ultimate compressor station locations and segment of the line expected to be completed in 1949.

Secretaries' class, Iraq Petroleum Co., Ltd. Seated, left to right: Mrs. G. Abbott; Miss H. Tombalakian; Miss V. Vayouche; J. P. Gould, instructor; Mrs. N. G. Wade; Mrs. M. D. Wilson; Miss Y. Abdelmessih.

IRAQ COMPANY CONDUCTS SCHOOL IN DRILLING PRACTICE

MANY oil companies build and maintain schools, particularly those that operate in regions where such facilities otherwise would not exist. Mostly, however, the instruction provided is of an elementary nature and for the benefit of the children of employees, though adults not infrequently take advantage of it. Quite different and probably alone of its kind is the school which the Iraq Petroleum Company, Ltd., recently established at the headquarters of its exploration and production division in Tripoli, Lebanon. Its purpose is strictly practical and is designed to fit newcomers for the duties they will be called upon to perform for the company.

Inasmuch as Iraq Petroleum and its affiliates are British organizations, their field staffs are largely recruited from the British Isles. Many of the new employees have had no previous contact with oil field operations. To familiarize them with the basic features of oil production, the equipment with which it operates and the special terminology which the oil industry has developed, the plan for a special course of training was hit upon and was promptly approved by Mr. G. Haseldin, deputy general manager, and the school was inaugurated early last year.

Director of the school is Jay P. Gould, chief engineer of drilling and production and assistant to the deputy general manager. The instruction is mainly in the form of lectures with textbooks, catalogs and special data as reference material. The course in drilling and production practices occupies approximately a month with five hours of daily lectures and study with written examinations at the end of each week which usually require seven to eight hours to complete.

The course begins with a general discussion of the geology of oil, followed by lectures on the function and operation of the equipment used in drilling from drawworks and their accessories to drill pipe, casing and bits. A second series of talks deals with mud handling, cementing, instruments and subsurface equipment of various kinds. The final series deals with such subjects as prime movers, fishing tools, gun perforation, separators, sampling, metering and gathering.

Although the extent of the ground covered suggests that no more than superficial knowledge can be imparted, the written tests call for a surprising amount of detailed information, and the excellent grades obtained by the trainees show that they have appplied themselves to their studies to very good effect. Grades are computed at the end of the course, and copies are sent to the Staff Department and form part of the personal files of the individual students. Men who show special aptitude in acquiring a technical background are given a special course in production practices extending over a period of six to eight months. On the whole the management has found the school of great value in conditioning trainees to a better understanding of the tools and processes employed in oil field work.

Men's third class, Iraq Petroleum Co., Ltd. Standing: J. P. Gould, instructor, chief engr., drilling and production, covenanted staff, Tripoli. Seated: front left, K. R. Kear, stores asst., Basrah Pet. Co.; right, W. G. R. Sutcliffe, exploration HQ, asst. mech. engr. Seated, left to right: P. C. Hart, drillers asst., Basrah Pet. Co.; W. G. Hill, general asst., Mosul Pet. Co.; R. C. Reed, stores asst., trainee, Petroleum Development Qatar; W. F. Wade, exploration staff HQ, acting stores coordinator; P. G. M. Hammett, driller's asst., Lebanon Pet. Co.; R. Milne, asst. engr., mud control, Syria Pet. Co.; and F. G. Collins, stores and transport officer, Mosul Pet. Co.

N. H. Azaar, office assistant, staff HQ; exploration officer, Iraq Pet. Co., Tripoli; instructor in Arabic, graduate of American University, Beirut.

The success that has attended the men's training courses has led to the establishment of a special course for women who are engaged in secretarial work. The ground covered is much the same as in the classes for men, but is less detailed. The primary purpose is to give secretaries greater familiarity with the subjects they are writing about and to add to their interest by this knowledge as contrasted to that when they are merely putting together meaningless words.

Another feature of the school is a course in Arabic conducted by N. H. Azaar who is a graduate of the American University in Beirut and whose position is that of special assistant in the exploration office. So highly does the company regard this instruction in Arabic that a special bonus of approximately $120 is provided for those who pass a satisfactory examination.

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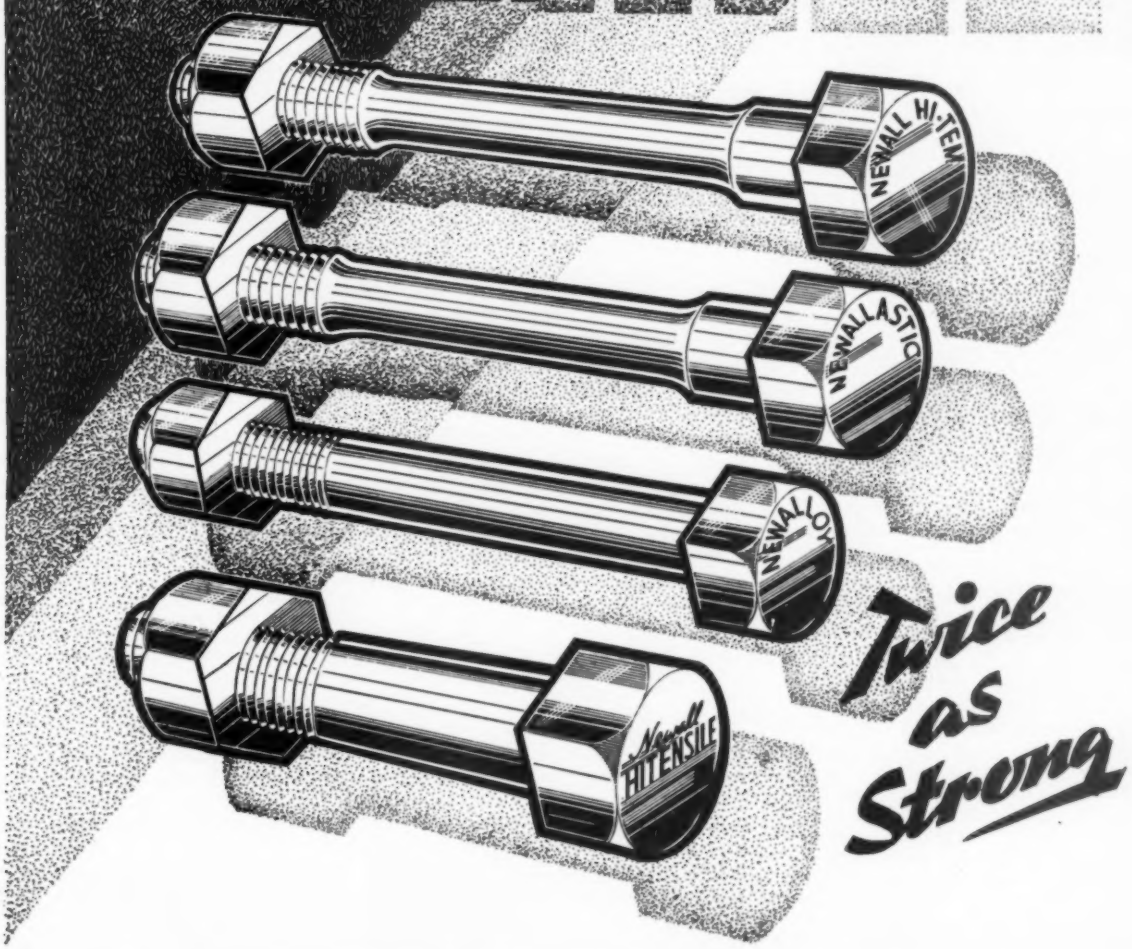

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International News and Notes

Ralph P. Bolton

RALPH P. BOLTON of the producing coordination department of Standard Oil Co. (N. J.) has been appointed its representative for affiliates engaged in producing, refining and marketing operations in Italy. Since 1944 Mr. Bolton has headed the company's producing activities in the eastern hemisphere. He joined the company 27 years ago as a general field assistant for an affiliate in Romania and within six months was promoted to field superintendent. He has served the company and various affiliates in many executive posts, including manager of producing activities in Europe and North Africa, general manager and managing director of the Romanian affiliate and general manager of all company affiliates in Argentina.

Colombian Field In Production

A small addition to oil production in Colombia took place recently when crude from the Teran-Guaguaqui field of Texas Petroleum Company began moving by pipeline to Puerto Niño when it is conveyed by barge to the Tropical Oil Company's refinery at Berranca Bermejo. Thus far the field has only two producing wells with a daily output of about 700 barrels, but additional drilling now under way is expected to expand this production.

Saudi Arabian Production

Crude oil production in Saudi Arabia during April amounted to 15,706,652 barrels or an average of 523,555 barrels per calendar day. For the first four months production averaged 516,961 barrels per calendar day.

International Gas Line

Frank McMahon, president of Pacific Petroleums,, Ltd., of Canada, has initiated a project for the construction of a 1400-mile, 30-inch natural gas pipeline to run from the northern part of the province of Alberta, Canada, west and then south through passes in the Canadian Rockies to Vancouver, and thence south through Washington and Oregon into northern California.

An act has been passed by the Senate and the House of Commons of the Canadian Parliament and sanctioned by the Governor General creating a Canadian corporation, Westcoast Transmission Co., Ltd., for the purpose of constructing and operating the Canadian part of the pipeline. It is expected that an American corporation will be formed to construct and operate the American end of the line and that application will be made to the Federal Power Commission in due course for a certificate of necessity. The completed pipeline is expected to cost about $175 million. Marketing surveys have indicated a demand in the region to be served of 500 million cubic feet daily.

Francis Edgar Rice

FRANCIS EDGAR RICE, vice president of Phillips Petroleum Co., was presented with the Hanlon award for outstanding service to the natural gasoline industry at the recent annual meeting of the Natural Gasoline Association of America. Presentation of the gold watch and plaque was made by C. R. Williams, association president.

In his presentation address Mr. Williams recounted that Mr. Rice made the Pershing gasoline plant the first successful oil absorption plant for rich casinghead gas. Subsequently in the Burbank field he pioneered the construction of the very large modern type plant with its tremendous concentration of compressors. The award citation covered numerous other contributions to the industry during the 30-odd years Mr. Rice has been head of the Phillips gasoline department.

Sherman Heads Mene Grande

Hoyt Sherman has been elected president of the Mene Grande Oil Co., Venezuelan affiliate of Gulf Oil Corp. He succeeds Chester M. Crebbs who has retired after 26 years during which the company grew from a relatively small organization into one of the "big three" of Venezuela.

Mr. Sherman brings to his new duties a broad knowledge of Venezuela's oil business, based on 21 years' experience with Venezuela Gulf and Mene Grande. He joined the Gulf Oil Corp. in the New York office in 1927 as assistant to C. W. Hamilton, now vice president in charge of foreign operations. He went to Venezuela in 1928 as assistant manager of Venezuela Gulf, whose main offices were then in Maracaibo.

Hoyt Sherman

After a transfer of the assets of Venezuela Gulf to the Mene Grande Oil Co. and the removal of its main offices to Caracas, Mr. Sherman was appointed general manager. Transferred in 1939 to eastern Venezuela, he remained in San Tomé until 1947 when he was named vice president and moved to Caracas.

Robert L. Boggs, until recently division manager in western Venezuela, replaces Mr. Sherman as vice president. An employee of the Gulf companies since 1927, Mr. Boggs came to Venezuela in 1928 and served as production engineer, chief petroleum engineer and executive assistant. In 1939 he was made assistant to the president of Mene Grande in Caracas and in 1946 was transferred to San Tomé as general superintendent and assistant manager of the eastern division. In 1947 he succeeded Mr. Sherman, then manager of the eastern division.

New President for YPF

General Ramón A. Albariño, president of Yacimientos Petroliferos Fiscales of Argentina, resigned recently, and Engineer Julio V. Canessa, general director of the State Gas Department, which is constructing the gas line from Comodoro Rivadavia to Buenos Aires, was named president of the board of YPF. Speaking on the occasion of the appointment, President Perón emphasized that the oil industry had not yet succeeded in satisfying the needs of the country and urged the staff to exert every effort to increase production as indispensable to the economic independence of the nation. General Albariño, one of the intimate collaborators of the President, has been named vice president of the Banco Industrial of Buenos Aires.

"Aquila" Plans Lube Unit

On April 18 the one-millionth ton of crude oil was processed at the Aquila refinery in Trieste since the plant was rebuilt after severe bomb damage sustained during the war. Reconstruction was started in 1946 and by May 1947 operations were resumed in the atmospheric and vacuum plants, chemical treatment plants and accessory installations. Throughput capacity of the refinery was increased and today is more than 140 percent of prewar.

Roughly three-quarters of Aquila's output goes to the Italian market and the free territory of Trieste, while the remaining quarter is exported and sold for bunkers.

Plans are under consideration for constrction of a modern plant for the production of about 25,000 tons per year of the full range of 100 VI lubricating oil from Middle East crude. It is expected that this plant will be in production at the beginning of 1951.

Robert L. Boggs

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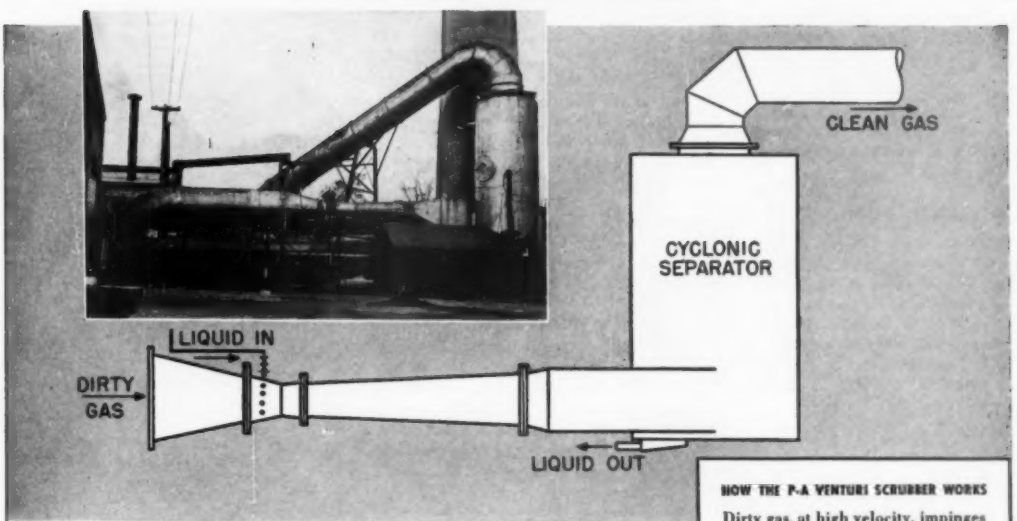

HOW THE P-A VENTURI SCRUBBER WORKS

Dirty gas, at high velocity, impinges upon and atomizes a curtain of liquid introduced through jets at the throat of the Venturi. Differential velocities of gas and atomized liquid result in collision of mist or dust particles with liquid droplets. The coalescence of mist or agglomeration of dust resulting from this collision makes simple cyclonic separation possible.

APPLICATIONS: The P-A Venturi Scrubber is a highly effective and economical apparatus for solving such major industrial problems as: SMOKE ABATEMENT • REMOVAL OF DUST AND MIST FROM GASES • RECOVERY OF VALUABLE METALS AND CHEMICALS.

ADVANTAGES: Highly efficient—Assures virtually complete removal even of sub-micron dust and mist.

Low initial cost—The first cost of the P-A Venturi Scrubber is considerably less than other equipment of equivalent performance.

Low Maintenance — Its maintenance cost is less than that of other equipment of equivalent performance.

Low Water Requirement — Requires generally less water (or scrubbing liquid) than other liquid scrubbers.

Can Handle Gas At Any Temperature—Pilot Plant tests show no difficulties even at 1800° F. Actual installations now operating at 700° to 800° F.

More Compact and Lighter—It requires less space and is lighter in weight than other equipment of equivalent performance.

Simple and Safe to Operate and Maintain—Any competent maintenance man can service a P-A Venturi Scrubber. No special skill is needed to repair equipment.

Chemico's engineering background and development facilities combined with Pease-Anthony's experience in gas scrubbing offers highly qualified service in this field.

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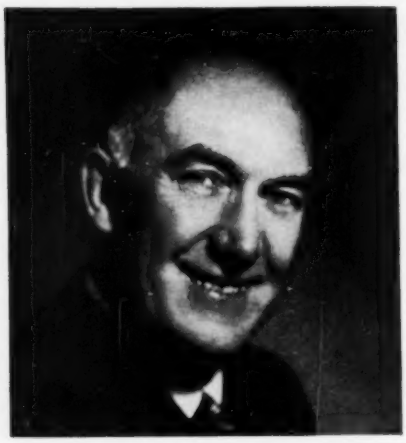


C. R. Woodfield

Heads Wakefield Production

C. R. Woodfield has been appointed general production manager for C. C. Wakefield & Co., Ltd., London, following the death of William Turner. F. J. Lock succeeds Mr. Woodfield as manager in the Hayes Works. The new Wakefield installation at Stanlow is to be managed by J. G. Bean who has been transferred from the Indian branch.

New Super-Tanker Launched

Launching of the super-tanker S.S. "Ras Al Ardh," under construction by Sun Shipbuilding and Dry Dock Co., on June 1 has been announced by R. L. Burke, vice president. This vessel, built for the Kupan Transport Co., will be the fourth launched in the large super-tanker program under construction by Sun Ship. Those completed and now in operation are the S.S. "Esso Zurich," S.S. "Kuwait" and the S.S. "Imperial Alberta."

Appointment of N. H. Birdseye

N. H. Birdseye, of Braithwaite & Co., Structural, Ltd., has been appointed vice chairman of the Council of British Manufacturers of Petroleum Equipment. He succeeds R. Gourlay of A. F. Craig & Co., Ltd., who has completed six years' service on the executive committee. Mr. Birdseye has for some years been serving as a member of the executive committee and of the finance committee.

Following a series of most successful visits to various refineries in the United Kingdom, during the course of which over 150 representatives of member firms have visited the Shell Haven refinery alone, the council is organizing a series of visits to Holland when members will tour the Pernis refinery and the Schoonebeck Oilfield.

Iran Production in 1948

Production of crude oil in Iran for the month of December is reported as 2,244,000 long tons or approximately 507,000 barrels daily. Production for the year 1948 was 24,870,000 long tons or roundly 524,000 barrels per day. Anglo-Iranian Oil Company's production in the United Kingdom in 1948 was 43,400 long tons or 334,000 barrels.

Concessions in Tunis

Announcement was made in Paris last month by the Ministry of Foreign Affairs that concessions to explore for oil in Tunisia had been granted to two companies, Serept-Shell and Serept-Gulf. As the names indicate, the major participants, Shell and Gulf respectively, will be associated with Soc. d'Etudes et de Recherches Petroliferes en Tunisie (SEREPT), which is jointly controlled by the French and Tunisian governments and holds undeveloped concessions in the North African protectorate. These, it is reported, are being enlarged to cover some 4,500,000 acres in the case of each company.

Open New Research Laboratories

The new central research laboratories of General Refractories, Ltd., in Sandy Lane, Workshop, were opened on April 26 by Sir Charles F. Goodeve, director of the British Iron and Steel Research Institute. A plaque erected in the entrance hall to the memory of the first chairman of the firm, Frank S. Russell, was unveiled by Sir Ronald W. Matthews, the present chairman.

The new laboratories will be used for the investigation of performance of refractories in use and for the development of new processes and new refractory materials. Facilities include physical, research chemical, sand, and bonding materials laboratories, library and conference rooms, x-ray room, petrographic room, records room, balance room, dark room, machine room, offices and stores.

Buys Nicol Company

The Staveley Coal & Iron Co., Ltd., has acquired the whole of the shares in R. D. Nicol & Co., Ltd., manufacturers of oils and greases. D. M. Anderson will continue to act as managing director, and M. Haigh as director and secretary.

Refinery for Dominican Republic

Agreement for construction of a refinery in the Dominican Republic has been concluded with International Industrial Consultants S.A., according to a report from Ciudad Trujillo. As projected the refinery will process 25,000 barrels of oil daily and will cost approximately $15,000,000. While the plant will be designed to produce a full line of products, one of the primary objectives of the Dominican government is to provide a dependable supply of fuel oil for the country's industries.

British Manufacturer Licensed

In order to make American-designed oil well pressure control equipment immediately available in unlimited quantities to oil producing areas throughout the world which operate on a sterling basis, Oil Center Tool Co. has recently licensed LeGrand, Sutcliff & Gell, Ltd., for the manufacture of O-C-T products in England, John Maher, president of Oil Center Tool Co., Houston, has announced.

In January 1949 Fritz Richard, O-C-T vice president in charge of manufacturing, Walter Stovall, technical adviser on tooling, and R. K. LeRouax, development engineer, went to Rochester, Kent, England, to assist LeGrand personnel in placing the material into production. LeGrand, Sutcliff & Gell, Ltd., is a firm of long standing in the manufacture of well drilling equipment, Mr. Maher said. For many years they have operated a large manufacturing plant and foundry at Southall, Middlesex. After the close of the war they converted an aircraft factory at Rochester, Kent, into an oil tool plant for the manufacture of oil field pumping units, rod elevators, polish rod grips, tubing spiders, casing heads, tubing heads and similar other oil field equipment.

Canadian Line Pipe Ordered

Imperial Oil Ltd., has placed orders for $9 million of line pipe for the proposed crude line to be laid from Edmonton to Regina. The 457 miles of 16-inch pipe will require about 67,000 tons of steel. Orders have been placed also for two pump stations which will give the line an initial capacity of 50,000 to 60,000 barrels daily. Later the capacity may be doubled if production in the Prairie provinces develops as is expected. The pipeline is expected to be ready for operation by the end of 1950.

P. T. Cox Manages Iranian Fields

P. T. Cox, deputy fields manager for Anglo-Iranian Oil Co., Ltd., recently succeeded H. S. Gibson as general fields manager. Mr. Cox joined Anglo-Iranian in 1924 as a geologist following his graduation from New Zealand University. He served in Peru, Venezuela, Colombia, Iran and Kuwait as well as the United Kingdom. During the war he left the company to serve with the Royal Engineers in the European theatre and was awarded the M.B.E. At the end of the war he rejoined the company and in 1946 was sent to Iran as manager of the petroleum division.

Marine Ropes

British Ropes, Ltd., Doncaster, has published a new book dealing with marine ropes of wire, hemp and nylon. Included in the booklet are tables giving breaking loads and weight for various sizes of ropes, including galvanized wire, manila and sisal ropes.

New Sohio President

W. Trevor Holliday, president of The Standard Oil Company (Ohio) since 1928, has been elected chairman, and Clyde T. Foster, for the past year executive vice president, has been elected president. Mr. Holliday will continue in active charge of matters of major policy affecting the company and its subsidiaries, and Mr. Foster, as chief executive officer, will relieve him of executive details and be in direct charge of company operations which have grown from annual sales of $44 million in 1928 to almost $250 million today.

Clyde T. Foster

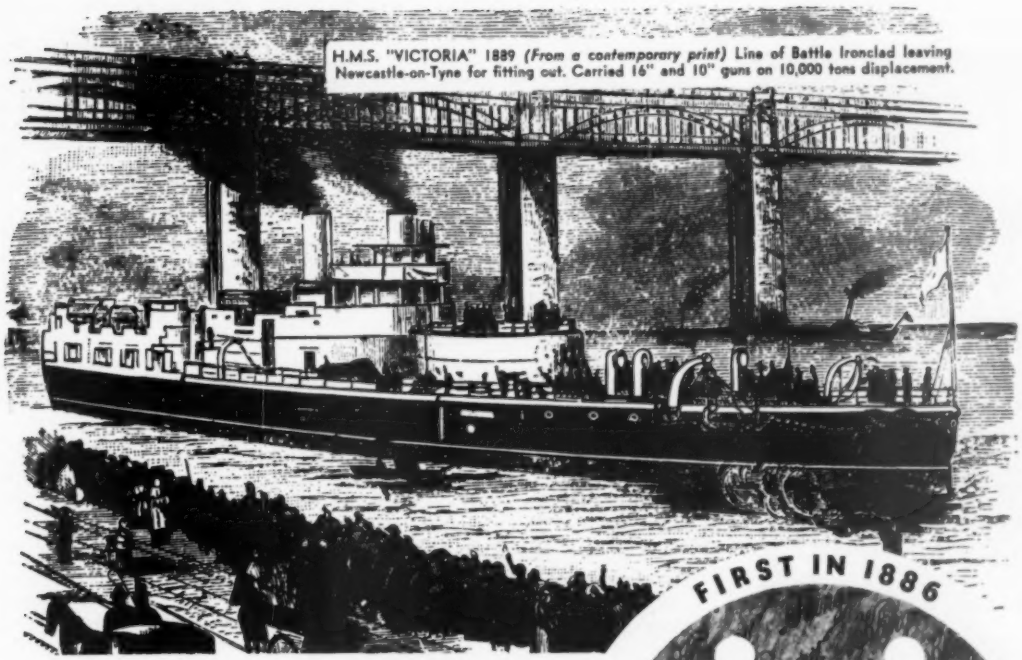
Mr. Foster joined Sohio in 1929 as assistant general manager of service stations, and since that time has been active in practically every phase of the company's business. In 1942 he was made assistant to the president and, in 1943, assumed additional duties as manager of industrial relations. In 1946 he became a director and vice president in charge of finance and accounting and in 1948 became executive vice president.

At the recent annual meeting Samuel H. Elliott, vice president in charge of transportation for Sohio, was elected a director to succeed the late A. M. Maxwell who died April 18.

New Sigmund Pumps Director

Dr. W. F. Reister

Dr. W. F. Riester, D.Sc. (Eng.), M. I. Mech. E., has been appointed to the board of directors as technical director of Sigmund Pumps, Ltd. Dr. Riester joined Sigmund Pumps in 1944 as chief projects engineer and later undertook the duties of chief engineer, with particular reference to the development of special process pumps. He is also in charge of Sigmunds' London office at Terminal House, 52 Grosvenor Gardens, S.W. 1.



H.M.S. "VICTORIA" 1889 *(From a contemporary print)* Line of Battle Ironclad leaving Newcastle-on-Tyne for fitting out. Carried 16" and 10" guns on 10,000 tons displacement.

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OIL COMPANY STAFF CHANGES

G. L. Stewart

G. L. STEWART has been elected president and H. H. Hewetson chairman of the board of Imperial Oil Ltd. Mr. Hewetson asked not to be nominated for re-election to the presidency in order that he might be relieved from the duties of chief executive and give more time to broader activities. He proposed Mr. Stewart, former chairman of the board, for the office of president. He pointed to Mr. Stewart's wide experience and demonstrated capabilities during many years in high executive offices.

Mr. Stewart was born in Winnipeg and received his secondary education there. He went east to McGill University in Montreal and graduated in 1914 as a bachelor of science in mechanical engineering. His career in the oil business began in 1916 when he joined the engineering department of Imperial Oil at Sarnia. He was made superintendent of Sarnia refinery in 1931 and in 1934 was appointed general manager of refineries. In 1944 he was elected a vice president and director, and in April 1947 he was elected chairman.

WILLARD W. WRIGHT has been appointed assistant general sales manager of Sun Oil Co. He has been regional manager for New England. Richard D. Drysdale, assistant regional manager for the Middle Atlantic states, Philadelphia, succeeds Mr. Wright as New England regional manager.

RICHARD GODFREY has been promoted to manager of the production and development department of The Bahrein Petroleum Co., Ltd. He entered the service of BAPCO as a petroleum engineer in September 1937 and has been stationed at Bahrein, Persian Gulf oil field since that time.

DWIGHT T. COLLEY and P. G. Wharton were elected directors of Atlantic Refining Co. at the company's recent annual meeting. The addition of the new directors, authorized by Atlantic's bylaws, increases the board to 11 members.

Henderson Supplee, Jr., director and vice president, was elected to the newly created post of executive vice president. Hugh W. Field, manager of the research and development department, was elected vice president. Dwight T. Colley was also elected vice president and named general manager of domestic sales, the post previously held by Mr. Supplee.

LOUIS B. WELLS has been appointed manager of Sun Oil Company's Marcus Hook refinery succeeding Andrew W. MacMurtrie, who is retiring after 39 years with the company. Charles E. Maschal was appointed assistant manager, and W. T. Askew superintendent.

Mr. Wells, the new refinery manager, started work at the Marcus Hook refinery in 1923. He was named assistant superintendent in 1933 and superintendent in January 1944. Mr. Maschal joined Sun as a still fireman at Marcus Hook in 1933. He served as a technical engineer from 1934 until 1939 when he was named an operating assistant. He became an assistant superintendent in 1944 and administrative assistant superintendent in 1947.

ROBERT FRIEDMAN, acting director of the Oil and Gas Division, Department of the Interior, since the resignation of Director Max Ball in 1948, has resigned to enter private industry. Mr. Friedman was urged by Secretary of Interior Krug and members of the National Petroleum Council to accept the post of Director, but he declined the offer, explaining that after 12 years in government service he felt that the time had come to satisfy the desire he had long had to engage in business activities.

J. R. Carringer

J. R. CARRINGER, vice president and assistant to the president of Esso Standard Oil Co., retired May 1 after 45 years with the company. In 1914 at the age of 28, he was associated with E. M. Clark in experimental pressure distillation leading to the Burton-Clark pressure still. After rising through various manufacturing positions, he was made assistant superintendent of the Bayway refinery at Linden, N. J., in 1918, and manager in 1926. He was appointed assistant general manager of refineries in 1936, a director and general manager of manufacturing in 1940 and a vice president in 1943.

H. T. EARL, H. B. Haney, R. K. Kelly, G. R. Kinter and J. E. Roth have been appointed vice presidents of Tide Water Associated Oil Co., according to an announcement by William F. Humphrey, president. Each of the new vice presidents has heretofore served as an assistant vice president of the company.

Mr. Earl, a veteran of 45 years with the company, is in charge of purchases and exchanges of crude oil and products required to supplement the production of the company's western division. Mr. Haney, manager of transportation of the western division, is in charge of all marine, pipeline, traffic and automotive activities of that division. He has a service record of more than 32 years. Mr. Kelly is manager of marine operations of the company's eastern division.

Mr. Kinter, a resident of Tulsa, Okla., entered the company's employ as a refinery chemist in 1921 and has been vice president of the company's subsidiary, Tidal Pipe Line Co., since 1934. He has been manager of the mid-continent division's manufacturing department since 1937. Mr. Roth, who also resides in Tulsa, was first employed by the company in 1924. He became chief production engineer in the company's mid-continent division in 1938 and production manager of the mid-continent division in 1940.

Heads Esso Laboratories

D. A. C. Dewdney has been appointed manager of Esso European laboratories. He has been manager of the development department of Esso Development Co. for the past two years. During the war he was on leave from the company to serve with the R. A. F.

G. F. MOORE has been named division gas superintendent for Stanolind Oil and Gas Co. at Casper. He will be responsible for the technical phase of the operation of Stanolind's natural gasoline, cycling and pressure maintenance plants in the Elk Basin and Salt Creek fields. Before moving to Casper he was in the company's manufacturing department in Tulsa.

BART GILLESPIE, widely known production engineer who has had many years of experience in Latin America, has been named as general manager of Mexican American Independent Company. The company recently entered into a contract with the Mexican government to undertake extensive drilling operations in the State of Tabasco and elsewhere in Mexico. During and since the war Mr. Gillespie was project manager for the Navy in charge of exploration on the department's Alaskan reserve.

REESE H. TUCKER has been named chief geologist for Cities Service Oil Co. (Del.), and A. K. Wilhelm has been appointed executive assistant in the geological department. Mr. Tucker has been manager of the company's geophysical section since June 1948. He was first employed by Cities Service Oil Co. as a junior engineer in 1930, after graduating from the University of Colorado. He was assigned to the geological division, where most of his time was spent in geophysical work. Mr. Wilhelm steps into the new post of executive assistant in the geological department after almost four years as Bartlesville division chief geologist.

Reese H. Tucker

Plowing-Back BUILDS FOR THE FUTURE!

It's a Wise Farmer (OR OIL COMPANY) who heeds this Truth!

DURING 1948, Socony-Vacuum plowed back $201,000,000 into its business . . . $68,000,000 more than the Company's net income for the year.

This money is providing a continuous source of crude oil supply, new refining facilities, additional pipelines, tankers, new research facilities, expanded warehouses, storage plants, etc.

And the American Public will benefit:

. . not only in increased supply of finest quality products to meet today's unprecedented demand and growing new needs and uses for oil

. . but also through employment, new jobs for thousands of workers

. . and through helping to build a stronger Industry, increased oil potential for National Security!

For a great part of America's strength is the strength of her Industries—and none is more important than Petroleum.

As the Nation builds for a continually higher standard of living—for stability of employment—for peace and security—so must its industries *build for the future!*

Socony-Vacuum has planned and is carrying out just such a program—by "plowing back."

The Sign the Nation Knows—
Builds As the Nation Grows!

SOCONY-VACUUM

Photo courtesy The Farm Quarterly

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

Photo Stops Bubbles in Research Tower

A stroboscope is used to stop the flow of liquid in an unusual experimental bubble tower operated in connection with continuing bubble tray research by The M. W. Kellogg Co., chemical and refinery engineers. The accompanying photograph shows engineers artificially inducing severe dumping at right half of lower tray and excessive entrainment above left half. Droplets in left half are so violently agitated by the vapor that they are running countercurrent to the flow across the plate. Although this may cause good mixing of vapor and liquid, the lack of bubbling and consequent dumping at the right create a serious loss of efficiency. Entrainment of liquid into the top tray also impairs effectiveness of the equipment.

Kellogg initiated visual bubble tower research of this type back in 1935 with equipment which, although it produced useful data, did not approach in flexibility or ease of visual observation this postwar, transparent lucite unit.

The object of this intensified research into the "fluidynamics" of bubble tray operation is the creation of towers of smaller diameter and less height, yet with the same or greater throughput efficiency of present-day designs. The results of these postwar investigations are already apparent in some recent Kellogg-built and designed bubble towers.

Heads Youngstown Sales

Lew E. Wallace has been appointed general manager of sales and Jay W. Owings assistant general manager of sales for The Youngstown Sheet and Tube Co. Mr. Wallace has been manager of the company's New York sales office for the last 16 years. In his new position he will have two assistants, Myron H. Watkins, who has been assistant general manager of sales nearly two years, and Mr. Owings, who for the past two years has been manager of oil country tubular sales. Mr. Wallace succeeds the late Charles H. Longfield. John P. Feagley has been appointed district sales manager in charge of the New York office, succeeding Mr. Wallace. Mr. Feagley has spent 17 years with the company, all of them in the New York office.

New 16-Horsepower Engine

A new four-cylinder gasoline engine for a wide range of "Cub-horsepower" applications, the International U-1, has been announced by the industrial power division of International Harvester Co. Addition of the 16-hp U-1 expands the International line of carbureted engines to five ranging up to 55 rated hp. Overall dimensions of the engine are: 26 13/32 inches, length; 16 11/32 inches, width; 25 inches, height. The engine itself weighs approximately 280 pounds; the complete power unit, 450.

Boyd to Manage Chicago Offices

Philip G. (Jerry) Boyd has been appointed Chicago district sales manager for The Youngstown Sheet and Tube Company, succeeding Arthur Purnell who died April 1, Lew E. Wallace, general manager of sales, has announced. Mr. Boyd joined Youngstown in 1929 at the Detroit district sales office. After various appointments he was transferred to Chicago as assistant district sales manager in 1947.

Harold D. Skyrm

Elected Vice President of Gatx

Harold D. Skyrm was elected a vice president of General American Transportation Corp. at the recent annual meeting, according to an announcement by Sam Laud, president. Mr. Skyrm, who has been associated with General American for many years in several capacities, was recently made head of the process equipment, plate and welding and Wiggins Vapor Seals divisions, with offices in Chicago.

American Iron & Machine Appointments

The American Iron & Machine Works Co., Oklahoma City, has announced the appointment of Elmer E. Rubac as assistant to M. G. McCool, general manager, and Claude L. Griffin as assistant sales manager. Mr. Rubac, in addition to coordinating all departments at the Oklahoma City main plant, is in charge of advertising, warehouse and shipping department, and of the Oklahoma City sales office.

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OILFIELD
EFFICIENCY
AND FITTINGS
Cast & Forged Steel, Cast Iron & Gunmetal Gate, Stop & Check Valves for low, medium & high pressures & temperatures. Famous Newman-Milliken 6,000 lbs. Kerosene Tested Glandless Lubricated Plug Valves for Xmas Trees, Mud Lines etc.
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OF YOUR FITTINGS NEEDS FROM THE LADISH *Controlled Quality* LINE

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SEAMLESS WELDING FITTINGS
½"-30" STD. thru XXH

- 90° Elbows
- 45° Elbows
- 180° Return Bends
- Full Branch Tees
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- Concentric Reducers
- Eccentric Reducers
- Lap Joint Stub Ends
- Saddles and Caps

SEAMLESS REDUCING ELBOWS
2"x1"—6"x3" STD. AND XH

FORGED STEEL FLANGES
½"-30" 150# thru 2500#

- Welding Neck
- Slip-on
- Lap Joint
- Threaded
- Blind
- Socket-Welding
- Reducing
- Orifice Unions

LONG WELDING NECKS

LARGE O.D. FLANGES
26"-96" 50# thru 250#

FORGED STEEL FITTINGS
Screwed and Socket Weld
⅛"-4" 2000# thru 6000#

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- Reducers
- Bushings
- Plugs
- Caps

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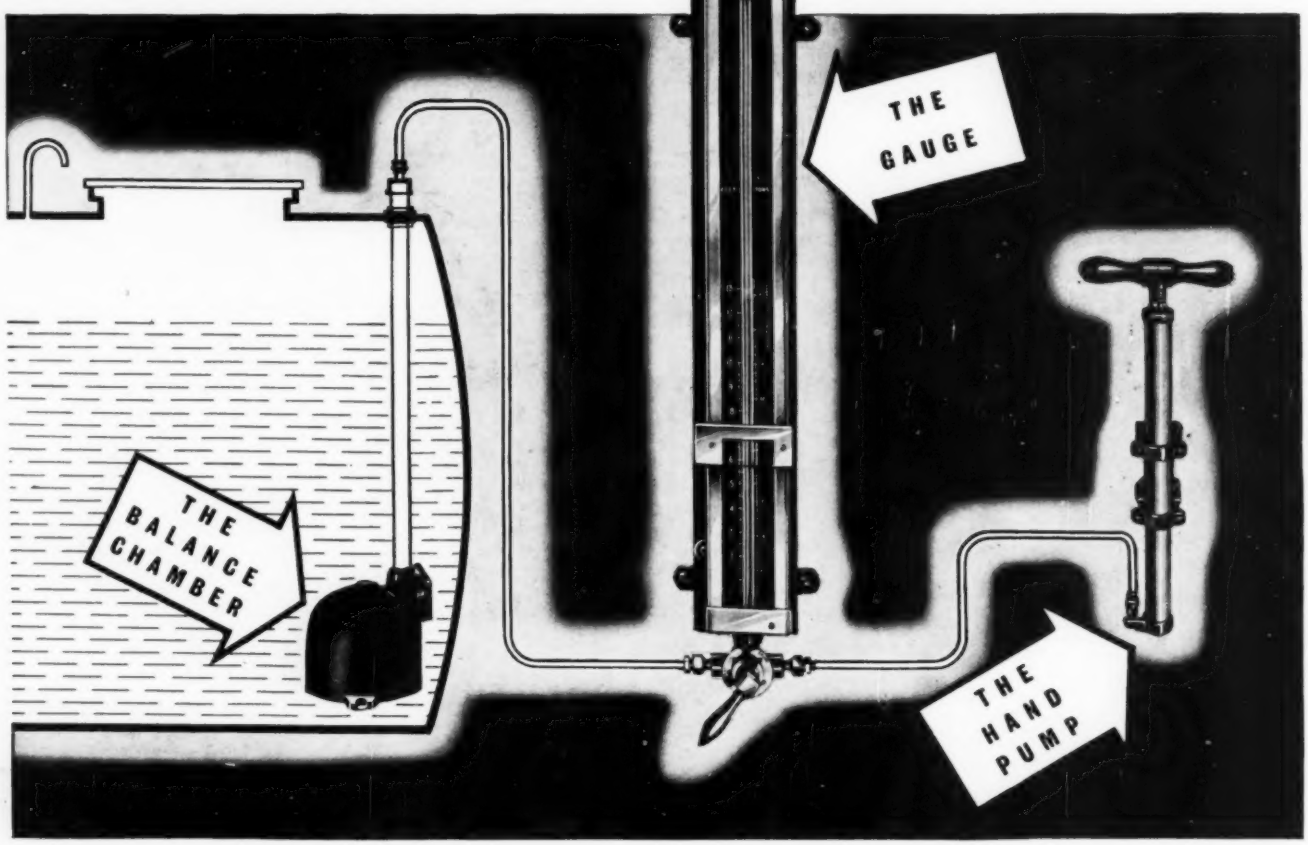
On this Tank Gauge You can get

DEPTH · VOLUME · WEIGHT

THE function of the K.B.B. Pneumercator gauge is to measure with absolute accuracy any liquid in any size tank. It is equally efficient when used with water and various chemicals including acid or alkaline liquids. Tanks may be open, closed or under vacuum. The simple robust construction renders it unaffected by shocks or vibration and no springs, depth sticks or ball floats are involved. It comprises a balance chamber, a mercury gauge, a hand pump and the necessary air tubing — that's all. The gauge itself may be stationed in an office or control room, at any reasonable distance from the tank. It provides accurate information on tank stocks in a matter of seconds. Gauge scales are calibrated with extreme care to show $\frac{1}{16}$" or even $\frac{1}{32}$" of tank depth if desired.

In those cases where a liquid can be affected by contact with certain metals, special materials can be provided. K.B.B. Pneumercator Gauges are in world-wide use and once installed rarely need attention for the life of the tank.



MARINE INSTRUMENTS LTD

MARINE DIVISION OF KELVIN AND HUGHES LTD

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Capt. W. Shaw

New Commodore for Anglo-Saxon Fleet

Captain W. Shaw O.B.E., in command of the 18,000-ton tanker "Hyalina," is making his maiden voyage as Commodore Captain of the Anglo-Saxon Petroleum Company's fleet. Captain Shaw has completed 33 years' service with the fleet, having joined in October 1915 as third officer at the age of 20. He was given his first command—the "Crenatula"—in 1922 and saw service in the last war in the Atlantic. In 1943 he was awarded the O.B.E. for his services to the Allied cause. The fleet of which he is now Commodore has a deadweight tonnage, including vessels under construction, of 1,471,427 tons.

Appointed Vice President

Harold Bottomley, formerly chief process engineer for The Refinery Engineering Co., of Tulsa, has recently been appointed a vice president of the company, according to T. M. Lumly, president. Mr. Bottomley joined the company in 1947 after having served in various engineering capacities with Republic Oil Refining Co., Cities-Service, Cosden, Kanotex and Shell. In his new position Mr. Bottomley will devote a greater portion of his efforts to contacting the company's clients in widely scattered sections of the country.

Tapline Agreement Signed

Final bar to early completion of Trans-Arabian Pipe Line Company's 1,067-mile oil line across Arabia to the Mediterranean Sea has now been removed. A decree permitting laying of the line across Syrian territory to Lebanon has been signed by the government and representatives of Tapline. The decree requires ratification by the cabinet, but no difficulty is anticipated in obtaining this.

As a result of the Syrian agreement Tapline officials plan to begin early work on the western end of the line. The eastern end is being laid now at the rate of about one mile daily. This will be stepped up to about one and one-half miles daily. Recent release of steel by the Department of Commerce and easing of the steel supply situation suggest that the line can now be completed by the end of 1950.

National Tank Opens New Plant

J. P. Walker, president of National Tank Co., Tulsa, Okla., has announced the opening of a new welding production plant with over five acres under roof. The new facilities permit the manufacture of much larger vessels of higher working pressure for petroleum and chemical in addition to all the present National Tank products. Special equipment installed includes two 50-ton cranes, seven five-ton cranes, six 10-ton cranes and a 400-ton hydraulic press, an annealing furnace which will accommodate vessels up to 15 x 15 x 80 feet, 2½-inch capacity plate bending rolls and equipment to x-ray steel up to 20 inches thick.

New products to be manufactured in the National plant will include fractionating and refinery columns; bubble, absorber, distillation and stabilizer towers; chemical tanks of all kinds, debutanizers, depropanizers, vacuum stills and many other refining and chemical processing units. National Tank Co. was organized in 1926 with a small shop, 12 employees and two field branches. Today it has 800 employees, 33 field warehouses and field service branches in 13 states and Canada.

A feature of the new plant is the lighting by means of translucent Fiberglas and plastic corrugated sheets which can be sawed and nailed for easy installation.

Petrol Engined Perfection

★ LINCOLN GENERATOR WITH DUAL CONTINUOUS CONTROL

★ HEAVY INDUSTRIAL ENGINE DESIGNED FOR DEPENDABILITY

★ BRITISH MADE THROUGHOUT

LINCOLN

WORLD'S LARGEST MANUFACTURERS OF ARC WELDING EQUIPMENT AND ELECTRODES

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F. W. Bremmer

F. W. BREMMER, National Supply Co., has been elected vice president in charge of manufacturing. The position has been vacant since the retirement of Charles R. Barton a year ago. Mr. Bremmer has been works manager of the Spang-Chalfant division's Ambridge plant since May 1948 and has been with the company for 25 years.

Heads New Product Development

The new product development department of American Cyanamid Co. announced the appointments of Dr. James R. Dudley as supervisor of new product development and John D. McPherson as supervisor of market research activities. The recently-formed new product development department of American Cyanamid Co. is chiefly concerned with determining whether there are economical uses for selected products which have been developed in the company's research laboratories and for which sales applications are not established. The department has already published a number of new product bulletins devoted to organic nitrogen compounds and eventually will work on a broader range of company products.

California Refinery Being Moved to Belgium

A $2,000,000 new construction program has been announced by the Raffinerie Belge de Petroles S.A. of Antwerp, for their Antwerp refinery and fuel bunkering station at Zeebrugge, Belgium. In connection with the project, the company has purchased two gas oil cracking units, a naphtha reforming unit, a gas recovery unit, a treating unit and a complete steam plant, together with other auxiliary equipment, from the Caminol Co. of Santa Fe Springs, Calif.

Dismantling and reconditioning for shipment to Belgium and reerection upon arrival at destination is being handled by the W. M. Barnes Co., of Los Angeles, and it is planned to have the units operating again by late fall of this year. Complete engineering drawings for reerection, together with modification of some of the equipment for the processing of sour crude oil is also being prepared by the Barnes organization.

The W. M. Barnes Co. is the same concern that completed the transfer of the war-time constructed Canol refinery from Whitehorse, Yukon Territory, to Edmonton, Alberta, Canada, for the Imperial Oil Co., Ltd. Another of their projects was the dismantling, reconditioning and transportation of the Pathfinder Refinery from Los Alamitos, Calif., to Naples, Italy, for Socony-Vacuum Oil Co.

The Raffinerie Belges de Petroles S.A. are also contemplating further expansion of their Antwerp holdings by the addition of a new topping unit.

New Reamer Rock Bit

Security Engineering Co. recently introduced a new and revolutionary reamer rock bit which is hanging up outstanding records for surface hole drilling. Combining in one tool a rock bit and reamer, it is possible for drillers to ream and drill in one operation with no need for another round trip to set surface casing.

Different types of bit tooth patterns are available in the new tool to meet varied top hole formation conditions. It provides a maximum bearing surface in the hole to remove drill pipe whip and vibration. The cutters are set at an angle to the vertical and contact over 20 percent of the circumference of the hole. In this way a fast cutting action is coupled with a downward thrust that aids the drilling bit. Formations are sheared away rather than being rolled or crushed into the wall of the hole. Available sizes run from 11¾ through 26 inches.

Canadian Production

Crude oil production in Canada averaged 51,000 barrels daily in February according to the Dominion Bureau of Statistics. This was an increase of 7,250 barrels daily over January, when the Dominion average was 43,750 barrels daily. In February a year ago, Canada produced 27,000 barrels of oil per day. The Redwater field almost tripled its production in February, rising from 2,000 barrels daily in January to 6,580 barrels daily. Leduc production rose from 22,900 barrels daily in January to 26,250 barrels in February.

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ANGUS CUPS

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Angus Cups—the first high-grade Valve and Seating Cups of British manufacture—are now available to Oil Field Engineers. Produced from "Gaco" Fabric composition, an extremely tough and wear-resisting compound, with our famous "Gaco" synthetic rubber as the bonding medium.

Layers of fabric are impregnated with "Gaco" and moulded under heavy pressure to form a tough compact composition capable of resisting the action of abrasion, crude oils and gases at high working pressures and temperatures.

Years of intensive research are behind the development of Angus Cups. Supplied in three hardnesses, sizes as laid down by A.P.I. standards.

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Our "Gaco" synthetic material, which achieved a wide reputation before and during the late war as a medium for hydraulic sealing in aircraft and engineering mechanisms, is also now available for the manufacture of other products used in the Oil Industry.

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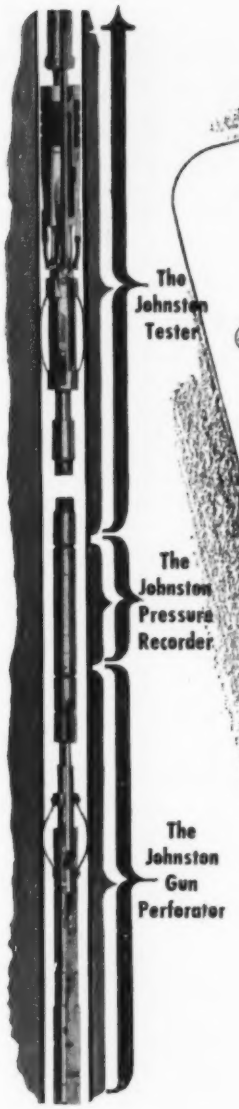
AGENTS THROUGHOUT THE WORLD



The Johnston "SHOOT-N-TEST" Gun Perforator connected to a regular Johnston Pressure Recorder and Formation Tester permits both casing perforation and formation test in a single trip of tubing or drill string.

MEMO TO:

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By unitizing a Johnston "SHOOT-N-TEST" Gun Perforator with your regular Johnston Formation Tester Assembly, any designated formation can be both perforated and tested in one round trip of tubing or drill pipe. The "SHOOT-N-TEST" Gun Perforator is easily connected to Johnston test equipment for combined Perforation and Test operations. Simple top-hole manipulation of the string by the driller prepares the Gun Perforator for firing -- existing hydrostatic pressure in the well trips the firing mechanism.

The Johnston "SHOOT-N-TEST" Gun Perforator has the versatility to be used solely as a casing perforator or as the perforating unit in combined perforation and test operations. Its design embodies many advanced features to make it the ideal choice for operators desiring the utmost safety and efficiency in perforation equipment.

THE JOHNSTON SHOOT-N-TEST GUN PERFORATOR

"SHOOT-N-TEST" with the JOHNSTON All-Purpose GUN PERFORATOR Offers These Features

- SAFER GUN OPERATION
- POSITIVE FIRE OF ALL BULLETS
- ANY NUMBER OF PERFORATIONS
- EXACT POSITIONING in test zone
- MINIMUM NUMBER OF EXPENDABLE PARTS
- FAST, EASY MAINTENANCE

Fully patented—covered by Patent Nos. 2,073,107, 2,189,919, 2,126,641, 2,129,216, 1,901,813, 2,161,233, 2,176,766, 2,218,988, 2,186,488, 2,307,360, 2,305,139, 2,295,634

SHOOT-N-TEST Trademark

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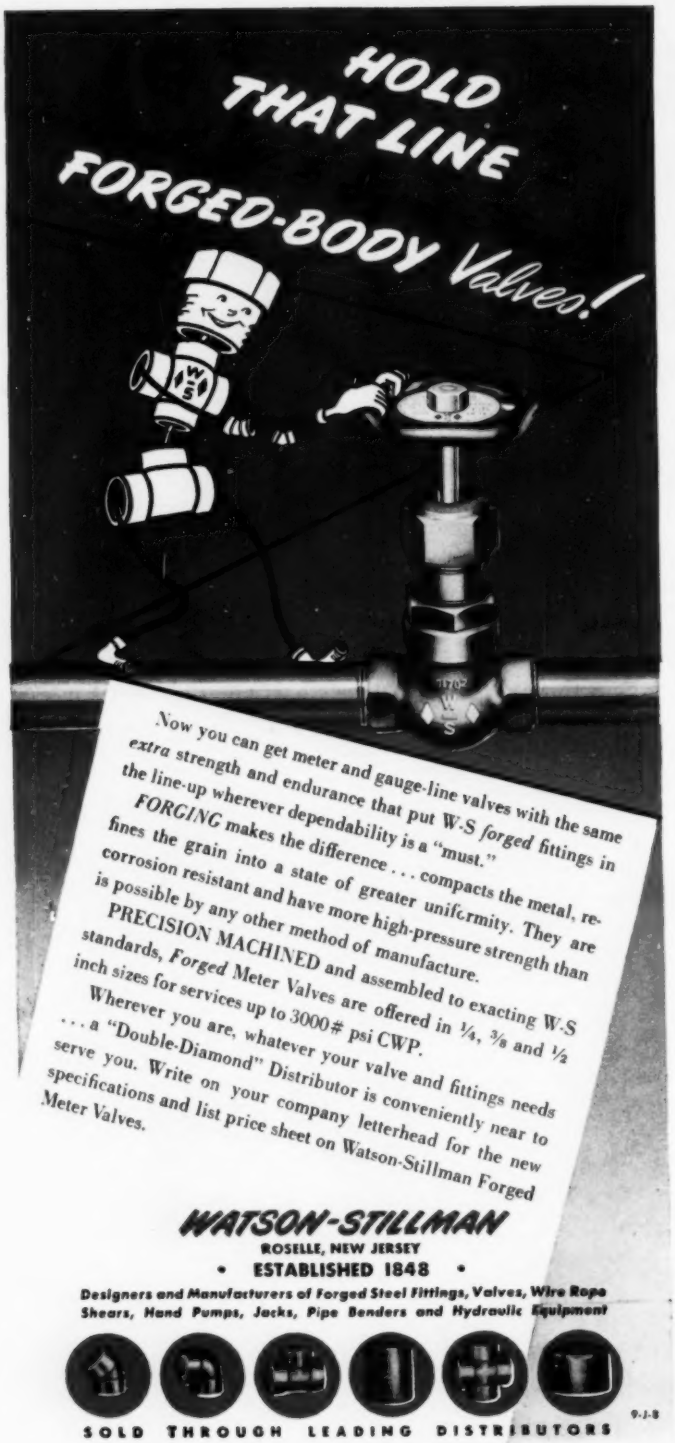
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FORGED-BODY Valves!
Now you can get meter and gauge-line valves with the same extra strength and endurance that put W-S forged fittings in the line-up wherever dependability is a "must."
FORGING makes the difference . . . compacts the metal, refines the grain into a state of greater uniformity. They are corrosion resistant and have more high-pressure strength than is possible by any other method of manufacture.
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Wherever you are, whatever your valve and fittings needs . . . a "Double-Diamond" Distributor is conveniently near to serve you. Write on your company letterhead for the new specifications and list price sheet on Watson-Stillman Forged Meter Valves.
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International Standardization Progress

(Continued from page 52)

sure apparatus, are of course available. These methods, however, are usually only suitable for adoption in large refineries, installations, etc. where adequate laboratory facilities exist and fully trained staff is available.

In this brief survey an attempt has been made to outline the activities of the Institute of Petroleum in the field of oil measurement standardization and to indicate that the problem is not being approached in an insular manner. Together with our American colleagues, under the able Chairmanship of L. C. Burroughs, much has been achieved, but it is realized that considerable work lies ahead, particularly in the wider international field. Every endeavor has been made by both bodies to keep the tenets laid down in the mutually agreed "Principles." In this we undertook co-operative work to establish oil measurement procedures and standards that would be acceptable both in the United States and in the British Commonwealth. We are convinced that such codes will hasten the elimination of major differences in the methods practiced in the two countries, and aid in world-wide uniformity of procedures. We have committed ourselves as to what shall be regarded as a "correct quantity" of oil and our attitude is that, whereas we do not advocate the replacement of the present simple instruments and methods by others more complex and cumbrous, no simple precaution should be omitted which tends to improve accuracy.

Much time and thought is being devoted to this work and those of us concerned in it have no difficulty in convincing ourselves and others of the very real practical results that we have achieved. Our work has been made the easier by the atmosphere of cordiality and goodwill on both sides of the Atlantic.

Editor's Note: The above article written especially for WORLD PETROLEUM was presented by Mr. Hyams as a paper before a conference on international standardization at Brussels on June 8. L. C. Burroughs, chairman of the ASTM division of oil measurement and sampling represented the United States at the meeting.

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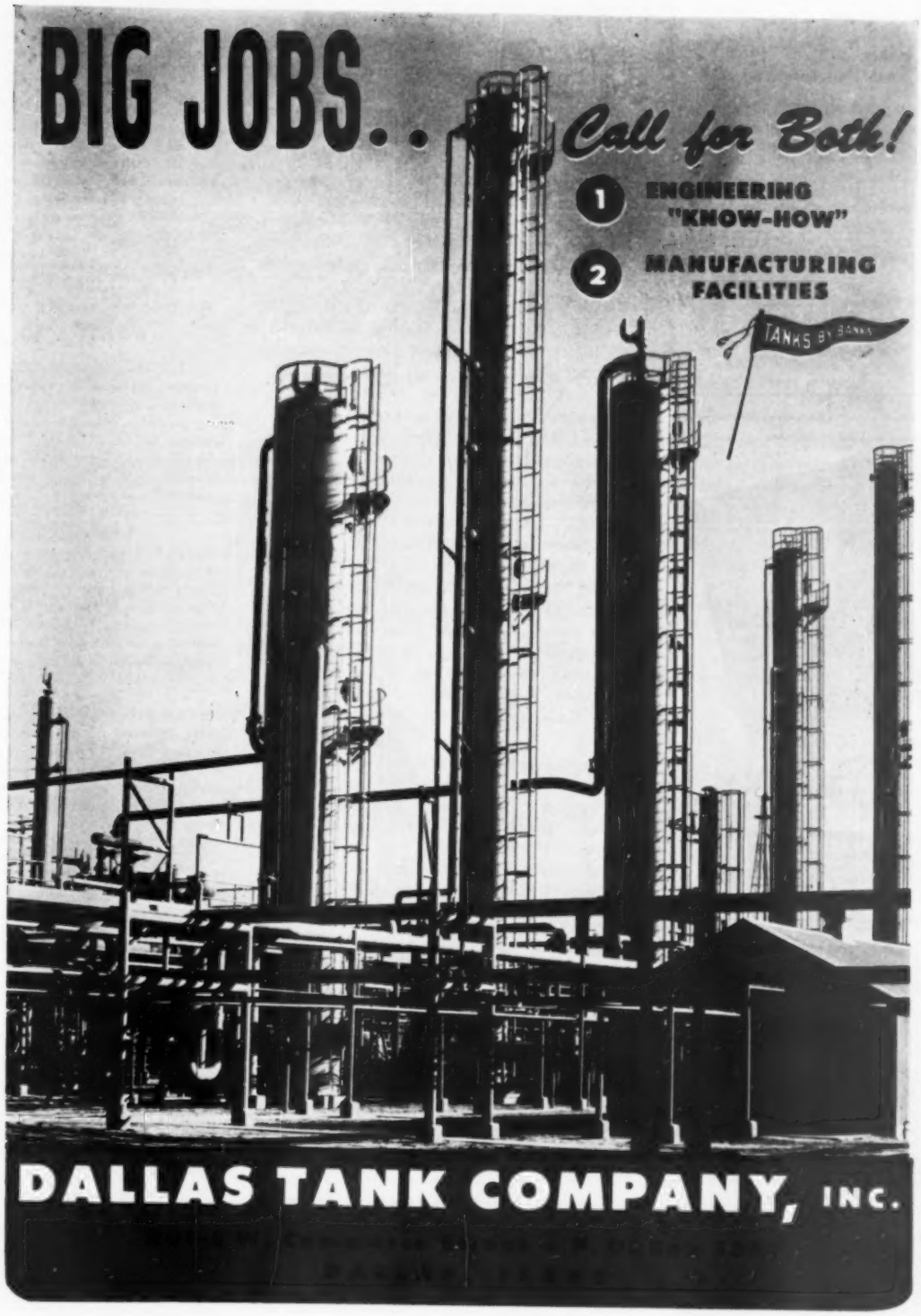
Infrared Analyzer

Perkin-Elmer Corp. announces the development of a new infrared analyzer for continuous automatic analysis of as many as six different components in a flowing stream of sample, either in the liquid or gas phase. The instrument consists of an infrared monochromator, an automatically driven turret, a Leeds & Northrup, 12-point, strip chart, recorder, and an amplifying circuit. The cycling time for a six component analysis is about six minutes.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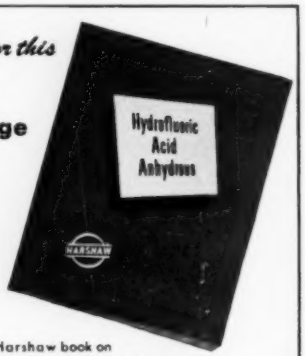

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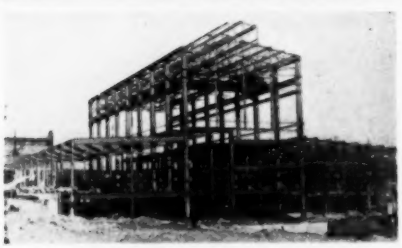

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Peak Profits for Oil in 1948 Were Largely Reinvested

(Continued from page 55)

expansion of facilities, and additional borrowings had to be incurred during 1948. This is evidenced by the fact that fund debts of seventeen companies, which have such debt outstanding, aggregated $1,810,988,514 at the end of 1948, a new high, and $351,256,000 higher than it was a year earlier. Compared with the end of 1946 this debt showed an increase of $701,000,000.

Eight of the seventeen companies reported increases in their debts during 1948. The largest was shown by Standard Oil Co. (Indiana) of $75,118,000, lifting its total indebtedness at the year-end to $249,464,586. Standard Oil Co. of California reported an increase of $62,421,000 to $107,217,702; Texas Co. of $17,000,000; Phillips of $57,900,000 and Socony-Vacuum of $45,000,000. Other increases were smaller.

In contrast to these increases, two companies—Ohio Oil and Tide Water Associated—liquidated their debts during 1948. As of the end of 1947 such debts totaled $3,000,000 and $4,500,000, respectively.

In reflection of the (1) increased borrowings in the capital markets, (2) sharply higher earnings during 1948, and (3) the sale of additional stock by Gulf Oil, net working capital of the twenty-three companies showed an increase of $301,500,000 to a new high of $2,995,548,000 compared with the end of 1947. It was $606,000,000 higher than at the end of 1946. Increases were shown by all but five companies.

In the accompanying tabulation is shown the net income, per share earnings on common stock, net working capital and other pertinent financial facts for the twenty-three American oil companies during 1948 compared with four previous years. In addition there are similar data on two foreign affiliates of Standard Oil Co. (N. J.); namely, Creole Petroleum Corp. and Imperial Oil, Ltd.

Technical Manual Published

Soon to be released by the Hughes Tool Co. is a new technical manual titled "Care and Operation of Tool Joints and Drill Collars." The purpose of this booklet, as explained by M. E. Montrose, Hughes vice president in charge of sales, is to provide the industry with a practical booklet which may prove of assistance in eliminating unnecessary tool joint troubles. The brochure is not of an advertising nature, but rather a factual presentation of the tool joint and drill collar failures most likely to worry the present-day operator. The most satisfactory methods of reducing these troubles are the conclusions drawn by the Hughes staff of tool joint experts through engineering and field research over a period of years.

In its foreword, "Care and Operation of Tool Joints and Drill Collars" points out that, since modern advances in tool joint design and construction have in such large measure eliminated the former failures of tool joint to drill pipe connection, the text of the book deals fully with tool joint troubles in pin and box connection. The operational practices which will eliminate the common causes of pin and box failure are discussed at length.

A general idea of the book's content may be realized by a review of the subjects covered—breaking in new tool joints, general operating recommendations, galling or "freezing," "wobbles," operational damage, O. D. wear, operation under extreme torque conditions, and repair of damaged tool joints. Since all of the recommendations which are made for the care of tool joint connections can be applied to the drill collar, only those points which merit special attention are discussed separately. These are taken up in the last three pages of the book.

"Care and Operation of Tool Joints and Drill Collars" is written in the language of the drilling industry; the purely technical engineering terms have been kept at a minimum, and each recommendation and condition is described clearly and thoroughly. The reason behind the conclusions arrived at are explained understandably. Accurate photographs provide helpful illustrations and accompany each point or process dealt with. The booklet is durably bound for use in either office or field. Copies are available without cost or obligation from the Hughes Tool Co., P. O. Box 2539, Houston 1, Texas.

1949 Oil Directory

The Petroleum Register, 27th edition, 600 pages, $15 postpaid, published by The Petroleum Register, 318 South Central Ave., Los Angeles 13, Calif. New edition published May 15 contains more than 40,000 individual listings of oil and allied companies and individuals in 130 countries throughout the world. A standard guide to the oil industry for more than a quarter of a century.

New Closure Plant

American Flange and Manufacturing Co., Inc., recently opened a new plant at Linden, N. J., which will largely increase the company's capacity to produce drum closures for the petroleum, chemical and other liquid-producing industries. The Linden plant has been equipped with newest types of machine tools and diecasting machines for the economical production of steel drum fittings in large quantities.

American Flange opened its first plant at Chicago 27 years ago for the production of the then newly patented closures designed to prevent loss of product due to pilferage or other causes. As the business grew, a second plant was erected at St. Catherines, Canada. The Canadian plant has been largely devoted to the production of Tri-Sure closures for the export market.

John Myers, secretary and general manager of American Flange, presided at the official opening of the Linden plant. Following the ceremonies at which the production line was set in motion, a luncheon was served by the company for official guests which included New Jersey state and Linden city officials.

John Myers Starts Plant

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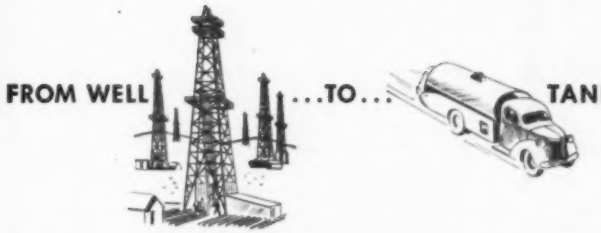

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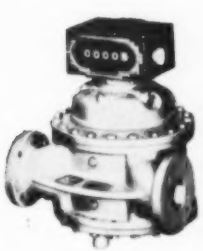

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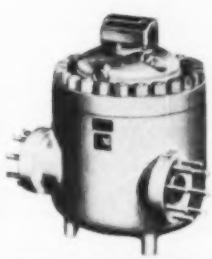

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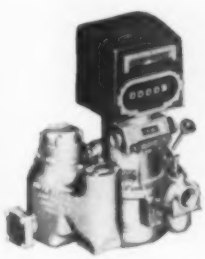

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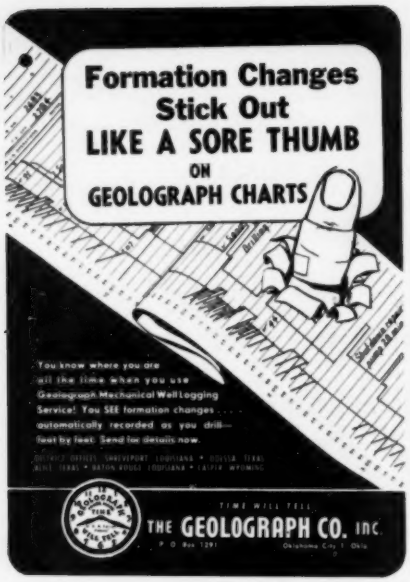
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Supercharged Four-Cycle Gas Engines

The successful development of a supercharged four-cycle gas engine, claimed to increase power output by 80 percent while cutting fuel consumption by one-third, has just been announced by The Cooper-Bessemer Corp. The idea has been the subject of speculation for years but generally discarded as impossible of accomplishment.

Heretofore, by far the highest efficiencies from gas fuel were obtained with dual fuel engines, but these necessitate the consumption of oil as a pilot fuel, a requirement tolerated in many installations solely for the sake of high efficiency rather than the conversion feature. Now without need for any pilot fuel whatever, the Cooper-Bessemer four-cycle, spark-ignited gas engine attains efficiencies equal to or exceeding the best performance of gas-diesels, stated company officials.. R. L. Boyer, Cooper-Bessemer vice president and chief engineer, said that successful development of the engine was aided materially by new principles worked out by Cooper-Bessemer while perfecting the Turboflow gas engines of two-cycle design.

Where conventional spark-ignited gas engines operate on a fuel input of 9,500 to 10,000 Btu per horsepower hour, the new engine requires less than 7,000 Btu. By achieving an increase in brake-mean effective pressure from the normal 70 pounds to 125 pounds per square inch, the engine is able to produce an 80 percent power increase over ordinary gas engines with the same piston displacement.

Ris Heads Griscom-Russell

Kenneth B. Ris, vice president in charge of sales, has been elected president of the Griscom-Russell Co. to succeed Russell C. Jones, who retired after 40 years' service. Charles D. Steffens, who has been sales manager, was elected vice president of sales, and James W. Elizardi was elected vice president of petroleum sales, reporting to Mr. Steffens. Mr. Ris joined Griscom-Russell employ in 1922. After serving successively in the New York engineering department, the Chicago, New York, Tulsa and Dallas sales offices, he was made manager of the petroleum sales division in 1931 and sales manager in 1934. In 1946 he was elected vice president and a director in 1948.

Bunker Service Barges Delivered

Esso Standard Oil Co. has taken delivery of the first two of a fleet of 22 all-welded steel barges for use in ships' bunker fuel service. Each barge will be equipped with cargo heater coils and rotary pumps capable of delivering 2,800 barrels an hour. The 20 barges still under construction by Dravo Corp. will be comprised of eight barges having a capacity of 18,000 barrels each, overall length of 242 feet, a 38-foot beam and a draft of 13 feet. The remaining 12 barges will have a capacity of 12,000 barrels each, an overall length of 178 feet and the same beam and depth as the larger vessels. The barges will be assigned to New York, Baltimore, New Orleans, Norfolk and Boston. Deliveries are expected to be completed in late November.

New Pumps

Within the past year Sigmund Pumps, Ltd., has largely increased its line of pumps for the petroleum industry as a result of the completion of its new factory at Gateshead. The new plant with 150,000 square feet of floor space has been equipped with facilities for testing up to 300 hp at 2800 rpm and 500 hp at 1450 or 3600 rpm. Steam is available at 400 psi. Test tanks are large enough to permit tests up to 40,000 gpm.

Recent additions to the line include peripheral pumps with outputs up to 500 gpm and with heads as high as 300-400 feet with one impeller. This is the result of incorporating a special impeller of star type and designing the pump so that the pumping action takes place around the periphery of the impeller. The range of Sigma process pumps has been extended considerably in recent months, so that the company can now offer a selection of pumps to the oil refinery and chemical industries which could in the past only be obtained from American sources.

New Kel-F Data Now Available

Sufficient practical experience with Kel-F, new thermoplastic, has now been acquired to issue three technical bulletins on the material, it was announced by The M. W. Kellogg Co. Bulletin #1-1-49 covers the physical and mechanical properties of Kel-F; Bulletin #2-1-49 is concerned with various molding techniques, while Bulletin #3-1-49 covers specific thermal treatment for varying the physical properties of the molded material. Copies of these bulletins may be obtained from the Chemical Manufacturing Division of The M. W. Kellogg Co., PO Box 149, Jersey City 3, New Jersey.

New Petroleum Register

The 27th edition of The Petroleum Register, just off the press, contains 40,000 individual listings, an increase of more than 5,000 from the 26th edition. The 600-page volume lists companies and individuals operating in all branches of the industry, producing, refining, marketing, natural gasoline, LP gas, grease and oil compounding, carbon black, asphalt and road oil, drilling and transportation. Government bureaus and oil associations are listed. Cost of the volume is $15 postpaid. Address orders to THE PETROLEUM REGISTER, 318 South Central Ave., Los Angeles 13, Calif.

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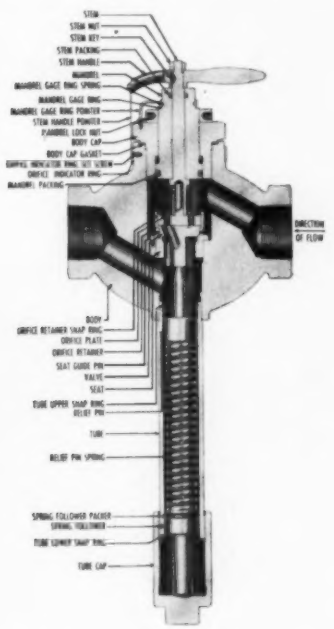
Long Pumping Record

This well in the Kadane field near Electra, Texas, went on pump in June 1942, and over a period of six and a half years has worked 56,232 hours out of a possible 56,784. During that time the engine required only one adjustment of tappets. Other shutdowns were for snubbing and cleaning the well. The pump is operated by an International U-4 engine which runs on waste oil and by an Oil Country special jack. The man in the foreground who appears so well pleased with the situation is W. J. Sanders, production superintendent for Kadane and Griffith Oil Company.

Automatic Flow Control

The Bowen automatic flow control is a completely new and revolutionary device for producing wells. Installed on the flow line at the well head, the device automatically controls production, automatically prevents excessive loading, permits positive regulation at the lowest possible gas-oil ratio, reduces paraffin problems to a minimum and automatically controls gas surges.



As shown in the cutaway drawing, the control consists essentially of a body, a spring-loaded valve and an adjustable orifice plate. The body provides the connections to the flow lines; the spring loading on the valve is controlled by adjusting the tube cap; the amount that the valve can open is controlled by adjusting the mandrel; the desired orifice in the orifice plate is selected by adjusting the stem handle. Upon installation it is necessary to adjust the spring loading and the valve opening and to select the proper orifice to meet the particular conditions of the well. After a very short test period, the initial settings can easily be adjusted to the exact requirements.

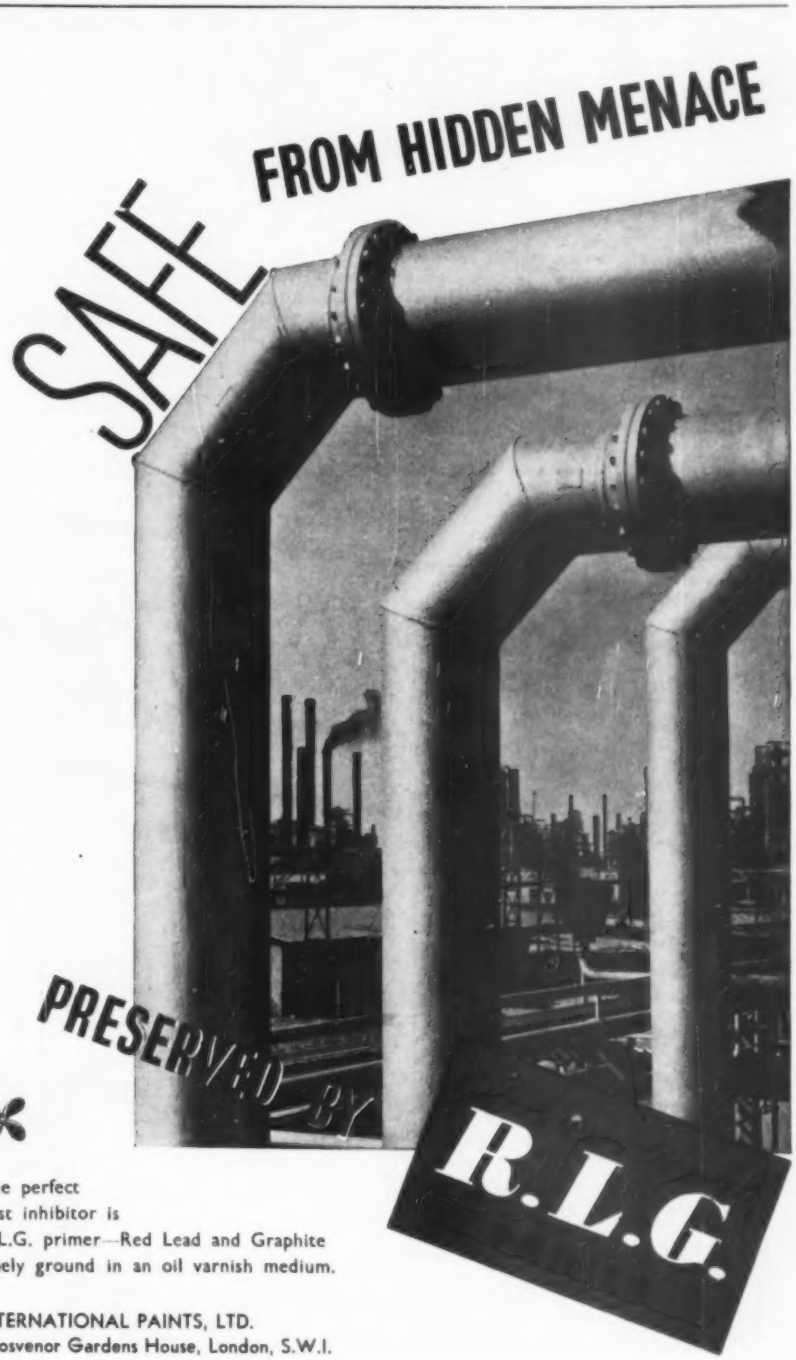
Pressure recorders are recommended accessory equipment, as they assist the operator in the proper setting of the unit and the charts will indicate when adjustments are necessary. An outlet is provided in the body for installation of the recorder.

American Cyanamid Promotions

The American Cyanamid Co. announces the appointment of C. F. Bonnet as production manager of its industrial and chemical division, and G. W. Russell as assistant sales manager of the same division. Mr. Bonnet, who has been with Cyanamid for more than 15 years, formerly served in the capacity of assistant general sales manager of the industrial chemical division. Prior to his new appointment, Mr. Russell has been manager of the new products development department and in his new capacity will take over the sales duties previously handled by Mr. Bonnet.

New Mud Warehouse

Mud Products, Inc., Tulsa, has opened a warehouse in Duncan, Okla. The new Duncan warehouse maintains a fleet of trucks on duty 24 hours a day and will service the south and southwestern Oklahoma drilling area.



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Texas Gas Line Approved

Texas Gas Transmission Corp., of Owensboro, Ky., has received approval from the Federal Power Commission to build a 26-inch gas line from Texas and Louisiana fields to a connection with the big inch pipeline system of Texas Eastern Transmission Corp., near Middletown, Ohio. The new 800-mile, $73,500,000 line will add approximately 400,000,000 cubic feet to the present pipeline capacity of the company. Completion is planned for the end of 1949. Existing pipe system of 1600 miles serves consumers in Louisiana, Mississippi, Arkansas, Tennessee, Kentucky, Indiana and Illinois.

Cites Premium Fuel Advantages

Just about half of all cars on the road require premium gasoline for knock-free performance, Julian J. Frey, general sales manager of Ethyl Corp., declared in an address before the marketing division of the American Petroleum Institute at St. Louis on May 10. Mr. Frey analyzed three independent surveys conducted by the Socony-Vacuum Oil Co., the Shell Oil Co., and Ethyl Corp., which indicate that only 30 to 50 percent of the present car population will be free of knock on the current regular grades of motor fuels. A more recent survey, he added, conducted under the auspices of the Coordinating Research Council, shows that the road octane requirements of cars in general are even higher than had been previously reported. All of these surveys, he declared, demonstrate that the number of cars which can benefit from premium gasoline is much larger than had been popularly supposed. Explaining this broad need for premium gasoline, Mr. Frey pointed to three basic factors: (1) the increasing number of new cars which are being designed specifically for operation on premium gasoline; (2) the wide variation in octane requirements among automobiles of the same make and model; and (3) the higher octane requirements of the average car as it accumulates mileage. The effect of the deposits may raise the requirement anywhere from 0 to 28 octane numbers. On the average the increase in requirement with use is of the order of eight to ten octane numbers and is independent of tetraethyl lead concentration of the fuel.

Mr. Frey showed that premium fuels promote engine improvement by permitting the construction of engines of higher compression ratio and improved thermal efficiency. These advances in engine design can be used to improve the fuel economy of the vehicles by as much as 15 to 25 percent, without impairing the high performance Americans have come to expect in their automobiles. He cited Cadillac and Oldsmobile 1949 models as examples. These require fuels with a Research octane number of 88 or higher. Actually they were designed for higher octane fuels but were de-rated to accommodate them to the antiknock level of the premium fuels sufficiently available now. Whenever better gasolines are generally marketed, these engines are so designed that with little basic alteration they can give still greater gains in power and economy. Other automotive manufacturers are developing new light-weight high compression engines.

New Midwest Gas Line

Authority to construct an $85,000,000 natural gas pipeline connecting the Texas-Louisiana Gulf Coast with the midwest has been granted by the Federal Power Commission to the Trunkline Gas Supply Co., Ralph K. Davies, president of the company, has announced. The line will supply natural gas on a wholesale basis to distributors. Engineering surveys have been completed for the more than 1,500 miles of 22-26-inch line which will be laid from the Gulf Coast to connect initially at Palmyra, Neb., with facilities of the Northern Natural Gas Co. serving Nebraska, Iowa, South Dakota and Minnesota through its own outlets and 31 other distributing utilities. These new facilities will transport 250 million cubic feet per day or more than 91 billion cubic feet per year.

The Trunkline Supply Co. was organized in 1947 by Mr. Davies, who is also president of the American Independent Oil Co.; P. MacDonald Biddison, consulting engineer of Chicago; Carl I. Wheat, attorney of San Francisco and Washington, D. C.; and Lewis MacNaughton, consulting geologist of DeGolyer and MacNaughton, Dallas, Texas.

Would Investigate Gasoline Prices

Latest suggestion of an oil industry investigation comes from Senator Burnet R. Maybank, of South Carolina. He is chairman of the Banking and Currency Committee of the Senate. His committee has an appropriation of $60,000 to spend on investigations, and he thinks a good place to spend this, or at least part of it, is on an inquiry into the price of gasoline. "With food product and other prices coming down, I can't see why gasoline prices should be going up," said the Senator. "Gasoline is quite a factor in operating a farm."

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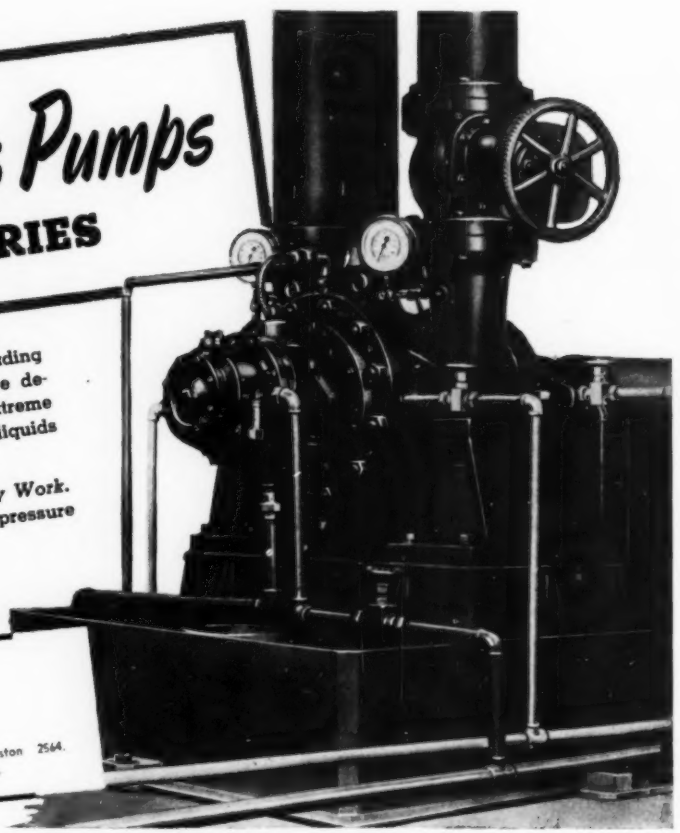

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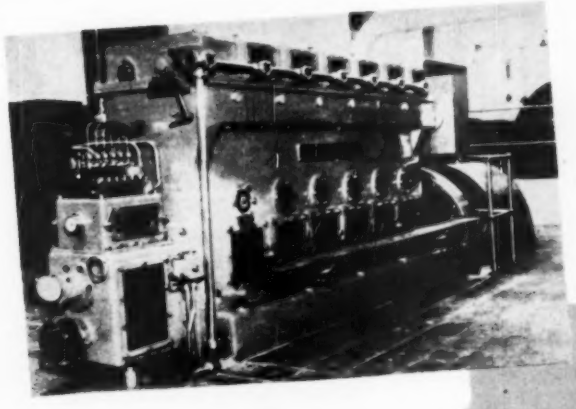

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The illustration shows a Crossley 300 B.H.P. four stroke, four cycle Diesel engine installed in the Sudan for irrigation purposes at a large pedigree cattle farm.

The engine drives a 24" centrifugal pump delivering 20,000 gallons of water per minute against a 30 feet head.

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Export Representative Appointed

D. T. O'Connor, New York, has been appointed exclusive export sales representative of the M. J. Crose Manufacturing Co., Inc., of Tulsa. The Crose Company manufactures a complete line of equipment for laying, cleaning and wrapping pipelines and are exclusive distributors of Vitron glass wrapping and Littleford kettles. Mr. O'Connor also represents the Shaffer Tool Works of Brea, California, and the Telematic Corp., of Chicago.

British Oil Consumers Council

Oil consumers in Britain have now a representative body to deal with the needs and viewpoints of consuming industries. Formed by the Ministry of Fuel and Power as a result of the dissolution of the Petroleum Board, the new council will consider any matter affecting the sale and supply of petroleum products in Britain. The oil industry is represented on the council by C. M. Merrick, managing director of Shell-Mex and B. P., and L. Sinclair, director of Anglo-American. They act as liaison with the oil industry. Membership of the council includes representatives from all the major oil-consuming industries and interests. This council follows the policy of ensuring that consumer interests are not ignored in any organizational scheme where monopoly tendencies might be alleged.

To Enlarge Gasoline Plant

Continental Oil Co. will spend approximately $1,500,000 for the enlargement of its natural gasoline plant in Starr County, Texas. Construction, which will begin immediately, will increase the gas capacity from 13 to 20 million cubic feet of gas daily. Output will be 5,800 gallons of butane and approximately 25,000 gallons of gasoline daily. About 8.5 million cubic feet of gas daily will be returned to the producing formation in the Rincon field.

Chenoweth Joins Republic

Republic Supply Co. has appointed Robert "Bob" Chenoweth as manager of machinery sales with headquarters in Houston. Chenoweth has been engaged in the sales of machinery to the oil industry since 1929. Since 1938 he has been located in Houston and has represented several of the large machinery accounts in the Gulf Coast and Mexico.

Iniskin Peninsula Map

A map showing preliminary results of petroleum investigations in the Iniskin Peninsula, Alaska, has been published by U. S. Geological Survey, Washington 25, D. C. Copies are 75 cents. Seepages of high-gravity oil have long been known on the Iniskin Peninsula. Several shallow wells were drilled there in the period 1898-1906, and a well 8,775 feet in depth was completed in 1939. Shows of oil and gas were reported in some of the wells, but petroleum has not been produced commercially.

Venezuelan Production

Production of crude oil in Venezuela during the month of March amounted to 35,792,135 barrels, an average of 1,154,585 barrels daily. As compared with February this daily average is lower by 73,645 barrels; and it is 90,672 barrels less than January's daily average. Exports of crude petroleum for the month of March amounted to 26,484,177 barrels. Production by companies is shown in the following table:

Company	West	East	Total
Creole	10,466,835	4,286,662	14,753,497
Mene Grande	730,286	5,009.264	5,739,550
Shell	12,683,781	—	12,683,781
Sinclair	—	519,518	519,518
Socony	—	1,031,602	1,031,602
Texas	—	162,479	162,479
S.A.P. Las Mercedes	—	465,769	465,769
B. C. O.	33,611	—	33,611
Phillips	—	59,294	59,294
Rexco	55,363	—	55,363
Atlantic	—	285,805	285,805
Guasare	1,866	—	1,866
Total	23,971,742	11,820,393	35,792,135

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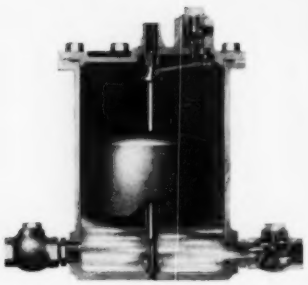

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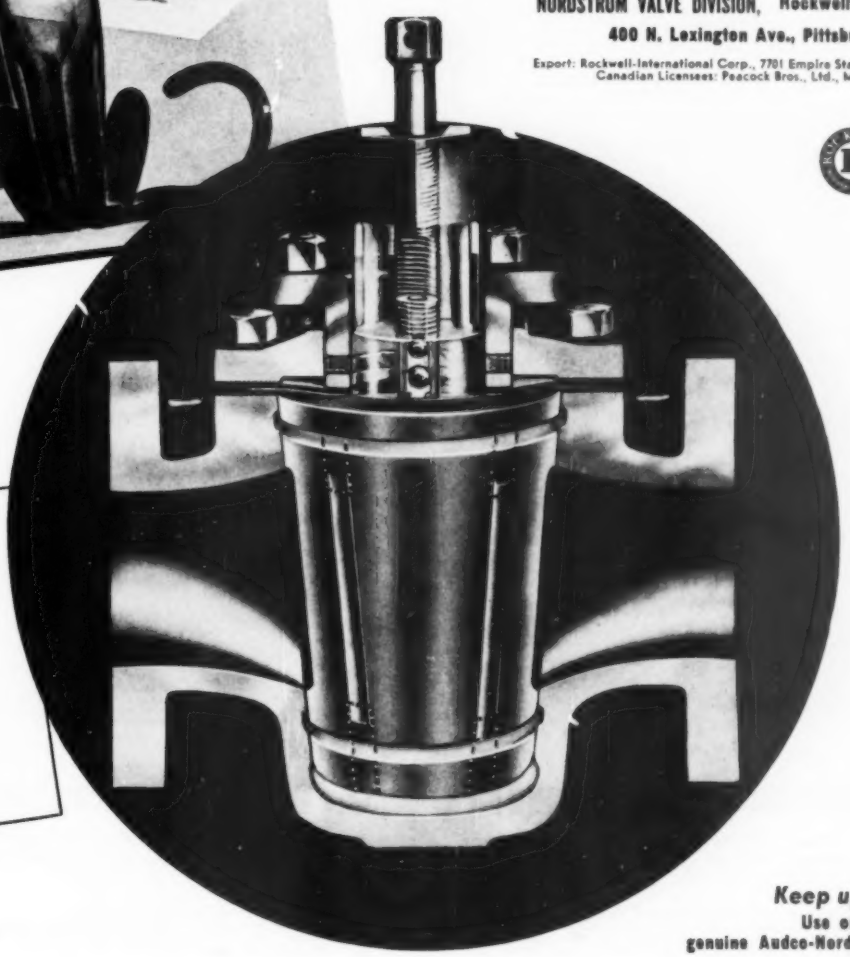

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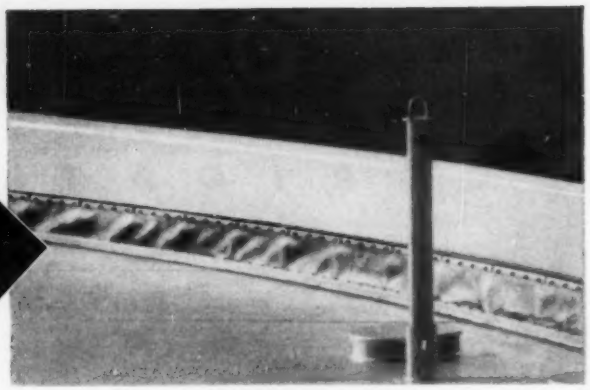

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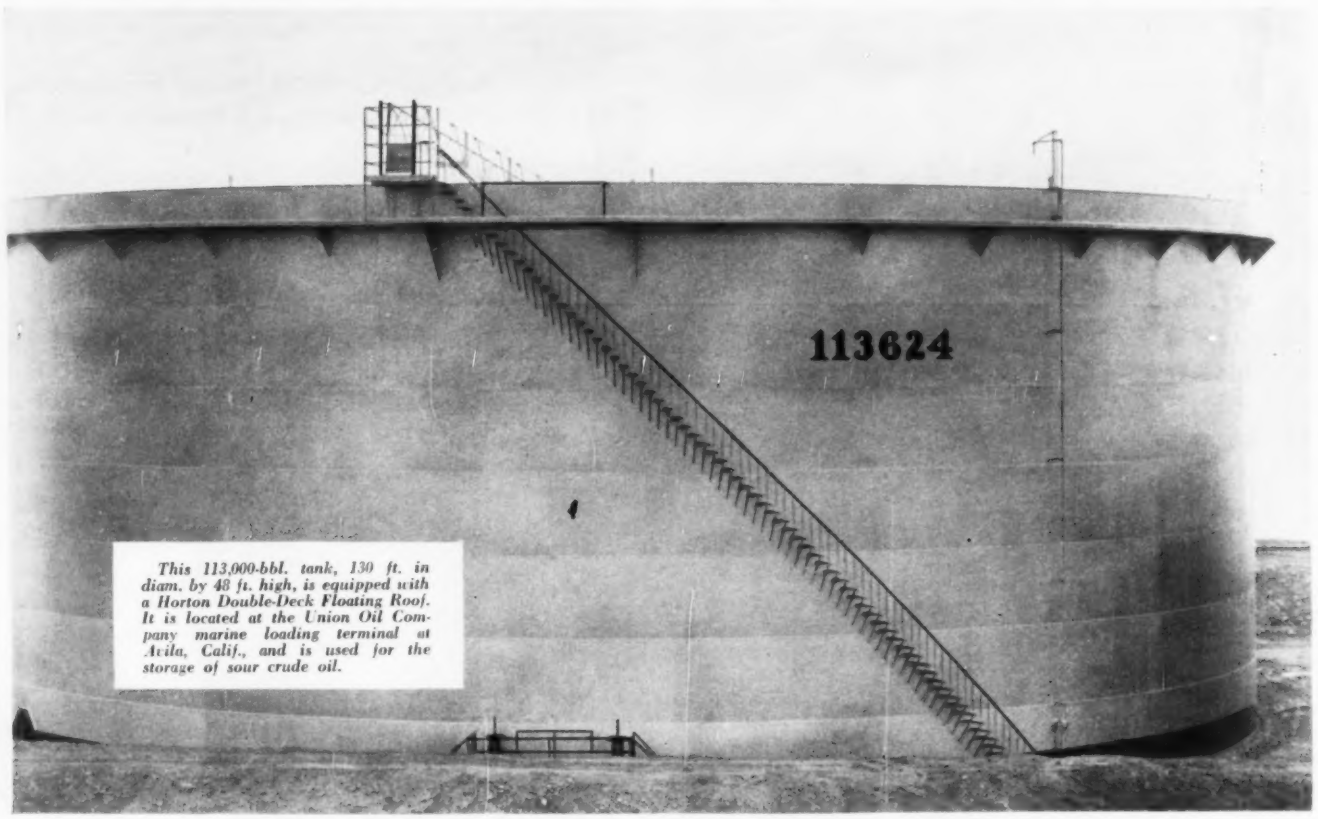
Horton seals are even more effective today because of new internal-type pantagraph hangers. These hangers hold the metal sealing ring snugly against the shell, so that it forms a long sliding contact with the tank shell.

You can materially reduce your evaporation losses by using the Horton Double-Deck Floating Roof on new or existing tanks that are filled and emptied frequently, tanks used in blending service, and tanks that store corrosive products. Horton Floating Roofs minimize corrosive action by preventing air from coming into contact with the underside of roof plates.

Ask our nearest office for a copy of Bulletin B, which contains complete information about Horton Double-Deck Floating Roofs.



This 113,000-bbl. tank, 130 ft. in diam. by 48 ft. high, is equipped with a Horton Double-Deck Floating Roof. It is located at the Union Oil Company marine loading terminal at Avila, Calif., and is used for the storage of sour crude oil.

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